**ST. XAVIER'S COLLEGE (AUTONOMOUS)**

Palayamkottai - 627 002

Affiliated to *ManonmaniamSundaranar University*

(Recognized as "College with Potential for Excellence" by UGC)

(Accredited with **"$A^{++}$" Grade with a CGPA of 3.66**)

# SYLLABUS

## B.Sc. ZOOLOGY
**(w.e.f. June2023)**

**Programme Name: B.Sc. ZOOLOGY**
**Programme Code: UZO**

## Aim and Objective

B.Sc. Zoology is a three year undergraduate academic degree programme mostly suited for students who are interested in nature, biology and especially animals.This degree programme in Zoology is designed in such a way to develop scientific attitude and interest among students towards learning the various aspects of zoology in particular and life science in general. The course papers are designed to impart essential knowledge in animal taxonomy, biochemistry, physiology, ecology, genetics, cell and molecular biology, aquaculture, entomology, immunology and microbiology. The various courses in the programme are aimed at developing proficiency both in theory as well as in practical through experiments, laboratory work along with the collection, interpretation and presentation of scientific data.

In addition to this, the students will be equipped with knowledge in the modern areas of biotechnology and its application in medicine, aquaculture, agriculture, and various bio-based industries like apiculture, sericulture, vermitechnology and animal husbandry etc. Students, who pursue this programme and pass out successfully, will surely have the urge to continue higher studies in **Microbial Gene Technology, Genomics, Biochemical Technology, Marine Biology, Environmental Biology,** Biochemistry, Microbiology, **Environmental Biotechnology,** Clinical Virology, Bioinformatics, Pharmaceutical and Analytical Chemistry.

## Programme Outcomes (Pos) for UG Programmes

Students of all Undergraduate Degree Programmes at the time of graduation will be able to attain the following:

**PO1. Critical Thinking:** Acquire knowledge in the respective field and take informed actions.

**PO2. Effective Communication:** Speak, read, write and listen clearly in person and through electronic media in English and in one Indian language, and make meaning of the world by connecting people, ideas, books, media and technology.

**PO3. Social Interaction:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional practice.

**PO4. Effective Citizenship:** Demonstrate empathetic social concern and equity centred national development, and the ability to act with an informed awareness of issues and participate in civic life through volunteering.

**PO5. Ethics:** Recognize different value systems and apply ethical principles and commit to professional ethics and responsibilities and norms of different value systems.

**PO6. Environment and Sustainability:** Demonstrate the issues of environmental contexts and sustainable development.

**PO7. Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern IT tools including prediction and modelling to complex activities with an understanding of the limitations.

**PO8. Self-directed and Life-long Learning:** Recognize the need for and have the preparation and ability to engage in independent and life-long learning in the broadest context of socio-technological changes.

**Programme Specific Outcomes :**

On completion of the B.Sc.programme in Zoology,the students will be able to:

- Classify, identify and list out common animals (invertebrates, vertebrates)
- Analyze the impact of the environment on the survival and well-being of organisms.
- Understand various genetic abnormalities
- Describe the role and impact of different environmental conservation programmes
- Summarize the importance of genetic engineering [cell culture, transgenic animals, antibiotics, engineered microbes, biodiesel, bio-plastics, biopesticides]
- Apply tools of information technology for all activities related to Zoology
- Develop self-employment skills such as vermitechnology, bee keeping, sericulture, aquarium fish keeping.
- Evaluate various potential risk factors to health of humans
- Manage harmful and beneficial animals

**Career Opportunities for B.Sc. Zoology students**

- Employment areas of B.Sc. Zoology includes: pharmaceutical companies, Environmental Agencies, Medical Laboratories, Museum, Agriculture and Veterinary Farms, Medical Representatives, Sales managers of bioproducts.
- After completing B.Sc. Zoology one can seek admission in a Master of Science where the student needs to gaina deep knowledge of science.
- B.Sc. course is globally agreeable where the students from science theme can pursue from any of the approved universities.
- Eligibility of students for higher studies: after completing UG Zoology, the students are eligible for admission in M.Sc., degree course in Zoology, Life sciences, Aquaculture, Forensic Science, Genetics, Microbiology, Biotechnology, Integrated biology, Physiology, Aquaculture, Marine biotechnology, integrated Ph.D, P.G diploma courses in lab technology, Radiology. Further eligible for B.Ed., TNPSC, IAS, IPS, IFS (group 1 exams); also eligible to get admission in MCA, MBA, **M.Sc. Microbial Gene Technology, Genomics, Biochemical Technology, Marine Biology, M.Sc. Environmental Biology,** Biochemistry, **Environmental Biotechnology,**Medical Clinical Embryology, Clinical Virology, Bioinformatics, Pharmaceutical and Analytical Chemistry**etc.**

- ❖ After completing B.Sc. Zoology, one can specialize in various fields within zoology like Arachnology, Entomology, Arthropodology, Apiology, Cetology, Anthrozoology, Conchology, Ethology, Helminthology, Mammalogy, Neuroethology, Myrmecology, Nematology, Ornithology, Paleozoology, Malacology, Primatology, Herpetology etc.

**Extra Credit Courses (ECC) for Advance Learners**

- ✓ Courses with extra credit for advanced learner are introduced to improve the knowledge base of the students in their Core Area
- ✓ These are self study courses and are optional
- ✓ There is no Continuous internal assessment tests (CIA)
- ✓ There should be no standing arrears for opting Extra Credit Courses
- ✓ Students are not permitted to write the course as arrear, if he / she fails in the courses with extra credit.

**CERTIFICATE COURSE**

- Eligibility for Admission: Candidate who passed 10 + 2 examination with at least 45% marks in aggregate in Arts / Science / Commerce.
- The candidate after passing examination will be awarded a separate "Certificate" in addition to his/her regular degree/Detailed Marks Card of B.A., B.Sc. and B.Com.
- The supplementary examination shall be held in April or as fixed by the Controller of Examination Office.
- The candidate who doesn't pass in the supplementary examination will be given another chance to appear in above said course along with forthcoming annual examination.
- A candidate who passed the course in the supplementary examination or in the third chance in annual examination can appear alongside in next subsequent examination of above said course.
- The candidate who is unable to pass the course in three given chances, will not be allowed to continue the above said course
- Every candidate will be required to attend minimum of 75% lectures/periods delivered to that class.
- The candidate must obtain 40% of the total marks in theory and practical separately to pass the course.
- The candidate must have obtained in House Examination at least 25% marks in the subject.
- Candidates will be offered English as the medium of Instruction/ Examination

**Objectives:**

To provide opportunities to learn and obtain knowledge and develop skills in various self employment opportunities in Zoology and allied aspects of Life Sciences. Students will be motivated to gain knowledge on the basics of the self employment awareness and also provide an opportunity to get training experience and exposure to the industry.

**B.Sc. ZOOLOGY - Programme Pattern**
**(With effect from June 2023)**

| Sem | Part | Status | Course Code | Title of the Course | Hours | Credit |
|---|---|---|---|---|---|---|
| I | I | Language | 23UGTL11 | General Tamil-I | 6 | 3 |
| | | | 23UGFL11 | French-I | | |
| | | | 23UGHL11 | Hindi-I | | |
| | II | English | 23UGEL11 | Communicative English-I | 6 | 3 |
| | III | Core | 23UZOC11 | Invertebrata | 5 | 5 |
| | III | Core | 23UZOC12 | Invertebrata- Practical | 3 | 3 |
| | III | EC | 23UCHE11 | Chemistry for Biological Sciences I | 4 | 3 |
| | III | EC | 23UCHE12 | Chemistry Practical For Biological Sciences - I | 2 | 2 |
| | IV | SEC-1 | 23UZON11 | Human Vectors/ Public Health and Hygiene (NME) | 2 | 2 |
| | IV | FC | 23UHER11/ 23UHEE11 | Foundation Course: Religion: Catholic doctrine/Ethics | 2 | 2 |
| | **Sub-Total** | | | | **30** | **23** |
| II | I | Language | 23UGTL21 | General Tamil-II | 6 | 3 |
| | | | 23UGFL21 | French-II | | |
| | | | 23UGHL21 | Hindi-II | | |
| | II | English | 23UGEL21 | Communicative English-II | 6 | 3 |
| | III | Core | 23UZOC21 | Chordata | 5 | 5 |
| | III | Core | 23UZOC22 | Chordata – Practical | 3 | 3 |
| | III | EC | 23UCHE21 | Allied Chemistry - II | 4 | 3 |
| | III | EC | 23UCHE22 | Allied Chemistry Practical - II | 2 | 2 |
| | IV | SEC2 | 23UZON21 | Ornamental Fish Farming (NME) | 2 | 2 |
| | IV | SEC3 | 23UHE121 | Integrated Personality Development | 2 | 2 |
| | **Sub-Total** | | | | **30** | **23** |
| III | I | Language | 23UGTL31 | General Tamil-III | 6 | 3 |
| | | | 23UGFL31 | French-III | | |
| | | | 23UGHL31 | Hindi-III | | |
| | II | English | 23UGEL31 | English-III | 6 | 3 |
| | III | Core | 23UZOC31 | Cell Biology | 5 | 5 |
| | III | Core | 23UZOC32 | Cell Biology Practical | 3 | 3 |
| | III | EC | 23UBOE31 | Allied Botany III ( Plant Science – I) | 4 | 3 |
| | III | EC | 23UBOE32 | Allied Botany III ( Plant Science – I) - Practical | 2 | 2 |
| | IV | SEC-4 | 23UHEL31 | Life Issues & Entrepreneurial Skill Development | 2 | 2 |
| | IV | SEC-5 | 23UZON31 | Animal Husbandry (NME) | 2 | 2 |
| | **Sub-Total** | | | | **30** | **23** |
| IV | I | Language | 23UGTL41 | General Tamil-IV | 6 | 3 |
| | | | 23UGFL41 | French-IV | | |
| | | | 23UGHL41 | Hindi-IV | | |
| | II | English | 23UGEL41 | General English-IV | 6 | 3 |
| | III | Core | 23UZOC41 | Biochemistry | 4 | 4 |
| | III | Core | 23UZOC42 | Biochemistry - Practical | 2 | 2 |
| | III | EC | 23UBOE41 | Allied Botany IV ( Plant Science – II) | 4 | 4 |
| | III | EC | 23UBOE42 | Allied Botany IV ( Plant Science – II) - Practical | 2 | 2 |
| | IV | SEC-6 | 23UZON41 | Aquaculture / Wild Life and Nature Watch(NME) | 2 | 2 |

| | | | | | | |
|---|---|---|---|---|---|---|
| | IV | SEC-7 | 23UZOS42 | Biostatistics | 2 | 2 |
| | IV | EVS | 23UEVS41 | Environmental studies | 2 | 2 |
| | **Sub-Total** | | | | **30** | **24** |
| V | III | Core | 23UZOC51 | Developmental Biology | 6 | 5 |
| | III | Core | 23UZOC52 | Ecology | 6 | 5 |
| | III | Core | 23UZOC53 | Developmental Biology–Practical | 2 | 2 |
| | III | Core | 23UZOC54 | Ecology – Practical | 2 | 2 |
| | III | EC | 23UZOE51 | Genetics and Animal Biotechnology | 5 | 3 |
| | III | EC | 23UZOE52 | Genetics and Animal Biotechnology – Practical | 2 | 1 |
| | III | EC | 23UZOE53 | Evolution | 5 | 4 |
| | IV | VE | 23DHEV51 | Human Rights & Social Analysis | 2 | 2 |
| | IV | Internship | 23UZOI51 | Internship | - | 2 |
| | **Sub-Total** | | | | **30** | **26** |
| VI | III | Core | 23UZOC61 | Animal Physiology | 5 | 4 |
| | III | Core | 23UZOC62 | Immunology and Microbiology | 5 | 4 |
| | III | Core | 23UZOC63 | Animal Physiology - Practical | 2 | 2 |
| | III | Core | 23UZOC64 | Immunology and Microbiology– Practical | 2 | 2 |
| | III | Core | 23UZOC65 | Project with viva voce | 6 | 3 |
| | III | EC | 23UZOE61 | Entomology | 4 | 2 |
| | III | EC | 23UZOE62 | Entomology - Practical | 2 | 1 |
| | IV | SEC-8 | 23UZOS61 | Zoology for Competitive Examinations | 4 | 2 |
| | V | Extension | | STAND | | 1 |
| | **Sub-Total** | | | | **30** | **21** |
| | **Grand Total** | | | | **180** | **140** |
| | | | **Additional Compulsory Courses** | | | |
| I UG | | Add-on (Any one) | 23UZOAO1/ 23UZOAO2/ 23UZOAO3 | Sericulture / Ornamental fish culture / Basics of Ornithology | | 2 |
| II UG | | Value added (Any one) | 22UZOVA1/ 22UZOVA2 | Basics of Medical Coding / Medical Laboratory technique | | 2 |
| III UG | | ECC (Any one) | 23UZOEC1 | Poultry Farming | | 2 |
| | | | 23UZOEC2 | Human Anatomy | | |
| | | | 23UZOEC3 | Animal Behaviour | | |
| | | | 23UZOEC4 | Biodiversity Conservation | | |
| | | | 23UZOEC5 | Pharmacology | | |
| | | | 23UZOEC6 | Ethno medicine | | |
| **Grand Total** | | | | | **180** | **146** |

**பொதுத்தமிழ்-1**

**Sub. Code : 23UGTL11**

| பருவம்: 1 | தாள்: மொழிப்பாடம் | Hrs: 6 | Credits: 3 |
|---|---|---|---|

**LEARNING OBJECTIVES: கற்றலின் நோக்கங்கள்**

1. முதலாமாண்டு பட்ட வகுப்பு மாணவர்களுக்குத் தமிழ்மொழி இலக்கியங்களை அறிமுகம் செய்தல்.
2. தற்கால இலக்கியப் போக்குகளையும் இலக்கணங்களையும் மாணவர் அறியுமாறு செய்து அவர்களின் படைப்பாற்றலைத் தூண்டுதல்.
3. தமிழ் இலக்கியம் சார்ந்த போட்டித் தேர்வுகளுக்கு ஏற்ப கற்பித்தல் நடைமுறைகளை மேற்கொள்ளுதல்.
4. மொழித்திறன்களை மாணவர்கள் அறிந்துகொள்ள தூண்டுதல்.
5. நவின இலக்கிய வகைமைகளை அறிமுகம் செய்தல்.
6. சமூகச்சிந்தனைகளை உருவாக்க இலக்கியப்பாடுபொருள் காரணமாய் உள்ளது என்பதை அறியச் செய்தல்.

**அலகு1: மரபுக்கவிதை**

1. பெ. சுந்தரனார் - தமிழ்த் தெய்வவணக்கம்
2. பாரதிதாசன் - சிறுத்தையே வெளியே வா
3. கவிமணி - புத்தரும் சிறுவனும்
4. முடியரசன் - மொழி உணர்ச்சி
5. கண்ணதாசன் - ஆட்டனத்தி ஆதிமந்தி (ஆதிமந்தி புலம்பல்)
6. சுரதா - துறைமுகம் (வினாத்தாள்)
7. தமிழ் ஒளி - கடல்

**அலகு2: புதுக்கவிதை**

1. அப்துல் ரகுமான் - வீட்டுக்கொரு மரம் வளர்ப்போம்
2. ஈரோடு தமிழன்பன் - சென்ரியூ கவிதைகள் (ஏதேனும் ஐந்து கவிதைகள்)
3. வைரமுத்து - பிற்சேர்க்கை
4. மு.மேத்தா - வாழைமரத்தின் சபதம்
5. அறிவுமதி - வள்ளுவம் பத்து
6. நா. முத்துக்குமார் - ஆனந்த யாழை மீட்டுகிறாய்
7. சுகிர்தராணி - சபிக்கப்பட்ட முத்தம்
8. இளம்பிறை - நீ எழுத மறுக்கும் எனது அழகு

**அலகு3: சிறுகதைகள்**

1. வாய்ச்சொற்கள் - ஜெயகாந்தன் (மாலை மயக்கம் தொகுப்பு)
2. கடிதம் - புதுமைப்பித்தன்
3. கரு - உமா மகேஸ்வரி
4. முள்முடி - தி. ஜானகிராமன்
5. சிதறல்கள் - விழி. பா. இதயவேந்தன்
6. காகிதஉறவு - சு. சமுத்திரம்
7. வீட்டின் மூலையில் சமையலறை- அம்பை
8. (மொழிப்பெயர்ப்புக் கதை) நாய்க்காரச் சீமாட்டி – ஒரு குறும்புக்காரச் சிறுவன்

**அலகு4: பாடம் சார்ந்த இலக்கிய வரலாறு**

**அலகு5 : மொழித்திறன் போட்டித் தேர்வு**

1. பொருள் பொதிந்த சொற்றொடர் அமைத்தல்
2. ஓர் எழுத்து ஒரு மொழி
3. வேற்றுமை உருபுகள்
4. திணை, பால், எண், இடம்
5. கலைச்சொல்லாக்கம், மொழிபெயர்ப்பு

**COURSE OUTCOMES: பயன்கள்**

இப்பாடங்களைக் கற்பதால் மாணவர் பின்வரும் பயன்களைப் பெறுவர்.

CO1– பாரதியார் காலந்தொட்டு தற்காலப் புதுக்கவிதைகள் வரை கவிதையிலக்கியம் அறிமுகப்படுத்தப்படுவதால் படைப்பாற்றல் திறன் பெறுதல். (K1,K2)

CO2– புதுக்கவிதை வரலாற்றினைஅறிந்துகொள்வர். (K2)

CO3- இக்கால இலக்கிய வகையினைக் கற்பதன் மூலம் படைப்பாக்கத் திறனைப் பெறுதல். (K4)

CO4– மொழி அறிவோடு சிந்தனைத் திறன் அதிகரித்தல். (K3)

CO5– தமிழ்மொழியைப் பிழையின்றி எழுதவும், புதிய கலைச் சொற்களை

உருவாக்கவும் அறிந்துகொள்வர். (K4)

CO6– காலந்தோறும் சமூகச் சிந்தனைகள் மாறுவதை இலக்கிய வரலாற்றின்

மூலம் அறிந்து கொள்ளுதல். (K6)

**TEXT BOOKS (பாடநூல்கள்)**

1. தமிழ்த்துறை வெளியீடு - தூய சவேரியார் தன்னாட்சிக் கல்லூரி, பாளையங்கோட்டை.
2. வகைமை நோக்கில் தமிழ் இலக்கிய வரலாறு– எ.ஃ.ப். பாக்கியமேரி

**REFERENCE BOOKS (பார்வை நூல்கள்)**

- தமிழ் இலக்கிய வரலாறு - சிற்பி. பாலசுப்பிரமணியன்
- புதிய நோக்கில் தமிழ் இலக்கிய வரலாறு – தமிழண்ணல்
- தமிழ் இலக்கிய வரலாறு – சேதுராமன்

**WEB SOURCES (இணையதளங்கள்)**

- Tamil Heritage Foundation- www.tamilheritage.org <http://www.tamilheritage.org>
- Tamil virtual University Library- www.tamilvu.org/ library http://www.virtualvu.org/library
- Project Madurai - www.projectmadurai.org.
- Chennai Library- www.chennailibrary.com <http://www.chennailibrary.com>.
- Tamil Universal Digital Library- www.ulib.prg <http://www.ulib.prg>.
- Tamil E-Books Downloads- tamilebooksdownloads. blogspot.com
- Tamil Books on line- books.tamil cube.com
- Catalogue of the Tamil books in the Library of British Congress archive.org
- Tamil novels on line - books.tamilcube.com

**பொதுத் தமிழ் - 2**

**Sub. Code : 23UGTL21**

| பருவம்: 2 | தாள்:மொழிப்பாடம் | Hrs: 6 | Credits: 3 |
|---|---|---|---|

**LEARNING OBJECTIVES: கற்றலின் நோக்கங்கள்**

1. சமய இலக்கியங்களையும் சிற்றிலக்கியங்களையும் மாணவர்களுக்கு அறிமுகப்படுத்துதல்.
2. மொழித்திறனையும் சிறுகதை இலக்கிய வடிவத்தையும் மாணவர்களுக்கு உணர்த்துதல்.
3. தமிழ் இலக்கிய வரிசையில் சமய இலக்கியங்களின் முக்கியத்துவத்தை உணர்த்துதல்.
4. தமிழ் இலக்கிய வரிசையில் சிற்றிலக்கியங்களின் முக்கியத்துவத்தை அறிமுகம் செய்தல்.
5. தமிழ் இலக்கிய வளமைக்குப் பல்சமயங்கள் ஆற்றிய பங்கினை உணரச் செய்தல்.
6. சமய, சிற்றிலக்கியங்களின் இடத்தைத் தமிழ் இலக்கிய வரலாற்றின் வழி அறியச் செய்தல்.

**அலகு 1:**

- திருநாவுக்கரசர் - தேவாரம் - நாமார்க்கும் குடியல்லோம் எனத் தொடங்கும் பதிகம் (10 பாடல்கள்)
- ஆண்டாள் - திருப்பாவை (முதல் 20 பாசுரம்)

**அலகு 2 :**

- வள்ளலார் - அருள் விளக்கமாலை (முதல் 10 பாடல்கள்)
- எச்.ஏ.கிருட்டிணப்பிள்ளை - இரட்சணியமனோகரம் - பால்ய பிராத்தனை
- குணங்குடி மஸ்தான் சாகிபு – பராபரக்கண்ணி (முதல் 10 கண்ணி)

**அலகு 3:**

- தமிழ் விடுதூது (முதல் 20 கண்ணி)
- திருக்குற்றாலக் குறவஞ்சி – குறத்தி மலைவளம் கூறுதல்
- முக்கூடற்பள்ளு – நாட்டு வளம்

**அலகு 4: பாடம் தழுவிய இலக்கிய வரலாறு**

(பல்லவர் காலம், நாயக்கர் காலம்)

**அலகு 5 : மொழித்திறன் - போட்டித் தேர்வுத்திறன்**

1. தொடர் வகைகள்
2. மரபுத்தொடர், பழமொழிகள்
3. பிறமொழிச் சொற்களைக் களைதல்
4. வழுச்சொற்கள் நீக்குதல்
5. இலக்கணக் குறிப்பு அறிதல்.

**COURSE OUTCOMES - பயன்கள்**

CO1– பக்தி இலக்கியங்களைக் கற்பதன் மூலம் பக்தி நெறியினையும், சமய நல்லிணக்கத்தையும் தெரிந்து பின்பற்றுவர். (K1,K2)

CO2– சிற்றிலக்கியங்களின் வழி இலக்கியச் சுவையினையும் பண்பாட்டு அறிவினையும் பெறுவர். (K2)

CO3– பட்டப்படிப்பினைப் படிக்கும்போதே பெரும்பான்மையான தமிழ் இலக்கியங்கள் குறித்த அறிவினைப் பெறுவர். (K4)

CO4– தமிழ்ச் சமூகப் பண்பாட்டு வரலாற்றினை இலக்கியங்கள் வாயிலாக அறிவர். (K3)

CO5– போட்டித் தேர்வுகளில் வெற்றிப் பெறுவதற்குத் தமிழ்ப்பாடத்தினை பயன் கொள்ளும் வகையில் ஏற்ற பயிற்சி பெறுவர். (K4)

CO6– பல்சமய இலக்கியங்களை அறிவதன் மூலம் பல்சமய உரையாடல்களின் முக்கியத்துவத்தை அறிவர். (K3)

**TEXT BOOKS (பாட நூல்கள்)**

1. தமிழ்த்துறை வெளியீடு, தூய சவேரியார் தன்னாட்சிக் கல்லூரி, பாளையங்கோட்டை.
2. வகைமை நோக்கில் தமிழ் இலக்கிய வரலாறு– எ.ஃ.ப். பாக்கியமேரி

**REFERENCE BOOKS (பார்வை நூல்கள்)**

- தமிழ் இலக்கிய வரலாறு - சிற்பி. பாலசுப்பிரமணியன்
- புதிய நோக்கில் தமிழ் இலக்கிய வரலாறு – தமிழண்ணல்
- தமிழ் இலக்கிய வரலாறு – சி.சேதுராமன்

**WEB SOURCES (இணையதளங்கள்)**

- Tamil Heritage Foundation- www.tamilheritage.org <http://www.tamilheritage.org>
- Tamil virtual University Library- www.tamilvu.org/ library http://www.virtualvu.org/library
- Project Madurai - www.projectmadurai.org.
- Chennai Library- www.chennailibrary.com <http://www.chennailibrary.com>.
- Tamil Universal Digital Library- www.ulib.prg <http://www.ulib.prg>.
- Tamil E-Books Downloads- tamilebooksdownloads. blogspot.com
- Tamil Books on line- books.tamil cube.com
- Catalogue of the Tamil books in the Library of British Congress archive.org
- Tamil novels on line - books.tamilcube.com

**பொதுத் தமிழ் - 3**
**Sub Code: 23UGTL31**

| பருவம்: 3 | தாள்: மொழிப்பாடம் | Hrs: 6 | Credits: 3 |
|---|---|---|---|

**Learning objectives: கற்றலின் நோக்கங்கள்**

1. காலந்தோறும் எழுந்த காப்பியங்களின் போக்கையும், புதினத்தின் இலக்கிய வடிவத்தையும் மாணவர்கள் உணருமாறு செய்தல்
2. காப்பியம், புதினம், ஆகிய படைப்பியல் வகைகளைப் பற்றிய பரந்து பட்டபுலமையைப் பெருக்குதல்.
3. தமிழ் இலக்கியங்களின் உள்ளடக்கம், வெளியீட்டுநெறி, படைப்பியல் கொள்கை ஆகியவற்றை அறியச் செய்தல்.
4. இலக்கியக் கொள்கைகளின் அடிப்படையில் இலக்கியங்களைத் திறனாய்வுச் செய்யப் பயிற்சி அளித்தல்.
5. படைப்புத் துறையிலும் ஊடகத் துறையிலும் கல்விப் புலத்திலும் அயல்நாடுகளிலும் வேலைவாய்ப்பினைப் பெறுதற்குத் துணைசெய்தல்.
6. மதிப்புரை, திறனாய்வு அறிமுகப்படுத்துவதன் மூலம் சிறந்த திறனாய்வுகளை அடையாளம் காணுதல்

**அலகு: 1**

சிலப்பதிகாரம ˙- வழக்குரைகாதை, மணிமேகலை – ஆதிரை பிச்சையிட்ட காதை, சீவகசிந்தாமணி - பூமகள் இலம்பகம், வளையாபதி

**அலகு: 2**

பெரியபுராணம் - பூசலார் புராணம், கம்பராமாயணம் - மந்தரை சூழ்ச்சிப் படலம், வில்லிபாரதம் - மற்போர் சருக்கம், சீறாப்புராணம் - புலி வசனித்த படலம்.

**அலகு: 3**

வஞ்சிமாநகரம் வரலாற்றுப் புதினம் - நா.பார்த்தசாரதி

**அலகு: 4**

பாடம் தழுவிய இலக்கிய வரலாறு

**அலகு: 5**

மொழித்திறன்

1. நூல் மதிப்புரை
2. திறனாய்வுசெய்தல்
3. கடிதம் வரைதல்
4. விண்ணப்பம் எழுதுதல்

**Course outcomes: பயன்கள்**

CO1 – காப்பியங்களின் வழி வாழ்வியல் சிந்தனையைப் பெறுதல். (K1,K2)

CO2 – காப்பியங்கள் அறிமுகப் படுத்தப்படுவதால் தமிழ் மொழியின் உயர்வையும், சிறப்பையும் உணர்தல். (K2)

CO3 – தமிழ் புதினங்கள் வழி சமகாலப் படைப்புகளின் வாழ்வியல் சிந்தனைகளைஅறிதல் (K4)

CO4 – நாவல் இலக்கியம் அறிமுகப்படுத்தப்படுவதால் சிந்தனை ஆற்றல், படைப்பாற்றல், கற்பனைத் திறன் வளர்தல் (K3)

CO5 – தமிழ் இலக்கியம் சார்ந்தபோட்டித் தேர்வுகளை எதிர்கொள்ளும் ஆற்றல் பெறுதல் (K4)

CO6 - கடிதம், விண்ணப்பம் எழுதும் முறைகளைஅறிதல் (K6)

**பாடநூல்கள் :**

**தமிழ்த்துறை வெளியீடு**

**பார்வை நூல்கள்**

1. **தமிழ் இலக்கியவரலாறு- சிற்பிபாலசுப்பிரமணியன்**

**இணையதளம்**

1. Tamil Heritage Foundation – www.tamilheritage.org<http://www.tamilheritage. Org>.
2. Tamil Virtual University Library – www.tamilvw.org/libraryhttp://www. virtualvu.org/library
3. Project Madurai – www.projectmadurai.org
4. Chennai Library – www.chennailibrary.com<http://www.chennailibrary.com
5. Tamil Universal Library- www.ulib.prg<http://www.ulib.pig7
6. Tamil E-books downloads – tamilbooksdownloads.blogspot.com
7. Tamil Books online – books.tamilcube.com
8. Catalogue of the Tamil Books in the library of British congress archive.org
9. Tamil novels.online – books.tamil.cube.com

**பொதுத்தமிழ் - 4**
**Sub Code: 23UGTL41**

| பருவம்: 4 | தாள்: மொழிப்பாடம் | Hrs: 6 | Credits: 3 |
|---|---|---|---|

**Learning objectives: கற்றலின் நோக்கங்கள்**

1. இலக்கியங்களின் சிறப்பினை உணர்த்துதல்
2. சங்க இலக்கியத்தின் மும் வாழிவயல நெறிகள உணர்தல்
3. தமிழ் இலக்கியங்களின் உள்ளடக்கம், வெளியீட்டுநெறி, படைப்பியல் கொள்கை ஆகியவற்றை அறியச் செய்தல்.
4. அகத்திணை, புறத்திணை இலக்கணங்களை மாணவர்கள் அறியச் செய்தல்
5. மொழிபெயர்ப்புத் திறனை வளர்த்தல்
6. நாடக இலக்கியங்களின் அமைப்பு முறையை அறிதல்

**அலகு: 1**

நற்றிணை 10, 14, 16, குறுந்தொகை - 16, 17, 19, 20, 25, 29, 38, 44, கலித்தொகை - 38, 51, அகநானூறு - 15, 33, 55, புறநானூறு - 37, 86, 112, பரிபாடல் - 55

**அலகு: 2**

நெடுநல்வாடை- நக்கீரர்

**அலகு: 3**

சபாபதிநாடகம் - பம்மல் சம்பந்த முதலியார்

**அலகு: 4**

பாடம் தழுவிய இலக்கியவரலாறு

**அலகு: 5**

மொழித்திறன்

1. மொழிபெயர்ப்புகலைச்சொற்கள்
2. கொடுக்கப்பட்டுள்ள ஆங்கிலப் பகுதியைத் தமிழில் மொழிபெயர்த்தல்
3. அலுவலகக் கடிதம்- தமிழில் மொழிபெயர்த்தல்

**Course outcomes: பயன்கள்**

CO1 – சங்க இலக்கியங்களில் காணப்படும் வாழ்வியல் சிந்தனைகளை அறிதல (K1,K2)
CO2 – தமிழின் தொன்மையையும் செம்மொழித் தன்மையையும் உணர்தல் (K2)
CO3 – நாடக இலக்கியம் மூலம் நடிப்பாற்றலையும் கலைத்தன்மையையும வளர்த்தல (K4)
CO4 – நாடக இலக்கியம் அறிமுகப்படுத்தப்படுவதால் சிந்தனை ஆற்றல், படைப்பாற்றல், கற்பனைத் திறன் வளர்தல் (K4)
CO5 – தமிழிலிருந்து அலுவலகக் கடிதங்களை மொழிபெயர்க்கும் அறிவைபபெறுதல் (K3)
CO6 - மோழி அறிவோடு வேலைவாய்ப்பினையும் பெறுதல். (K4)

**பாடநூல்கள் :**

**தமிழ்த்துறை வெளியீடு**

**பார்வை நூல்கள்**

**2. தமிழ் இலக்கிய வரலாறு- சிற்பிபாலசுப்பிரமணியன்**

**இணையதளம்:**

1. Tamil Heritage Foundation – www.tamilheritage.org<http://www.tamilheritage. Org>.
2. Tamil Virtual University Library – www.tamilvw.org/libraryhttp://www. virtualvu.org/library
3. Project Madurai – www.projectmadurai.org
4. Chennai Library – www.chennailibrary.com<http://www.chennailibrary.com
5. Tamil Universal Library- www.ulib.prg<http://www.ulib.pig7
6. Tamil E-books downloads – tamilbooksdownloads.blogspot.com
7. Tamil Books online – books.tamilcube.com
8. Catalogue of the Tamil Books in the library of British congress archive.org
9. Tamil novels.online – books.tamil.cube.com

**DEPARTMENT OF ENGLISH**

**UG – PART II - GENERAL ENGLISH**

**(The Seven-Tier Pattern recommended by UGC Curriculum Development Centre and Identified as Best Practice by NAAC)**

| | **Stream A** (For learners of high entry level proficiency) | **Stream B** (For learners of average entry level proficiency) | **Stream C** (For learners of low entry level proficiency) |
|---|---|---|---|
| Courses in Semester I | **IV 23UGEL14** | **III 23UGEL13** | **I 23UGEL11** |
| Courses in Semester II | **V 23UGEL25** | **IV 23UGEL24** | **II 23UGEL22** |
| Courses in Semester III | **VI 23UGEL36** | **V 23UGEL35** | **III 23UGEL33** |
| Courses in Semester IV | **VII 23UGEL47** | **VI 23UGEL46** | **IV 23UGEL44** |

**GENERAL COURSE OUTCOMES**

CO1 Acquire the four language skills (Listening, Speaking, Reading and Writing)

CO2 Develop the skill of independent reading and interpreting of graded texts

CO3 Expand and consolidate active and passive vocabulary

CO4 Acquire the skills needed to participate in a conversation that builds knowledge collaboratively

CO5 Acquire a clear understanding of English Grammar to facilitate accuracy of communication

CO6 Develop the skills of formal written communication to be used in academic and career related contexts

**TEXTS**

Course I - *Spotlight I*

Course II - *Spotlight II*

Course III - *Spotlight III*

Course IV - *Spotlight IV*

Course V - *Spotlight V*

Course VI - *Spotlight VI*

Course VII - William Shakespeare's *Julius Caesar* &
Charles Dickens' *Oliver Twist*

All Courses - *Active English Grammar and Composition* by the Board of Editors

**EXTERNAL EXAMINATION**

- External Examination has two components.
  1) Written Examination and 2) Viva Voce
- A three-hour written examination will be conducted for 100 marks for all General English papers and the scores will be converted to 40 marks, with a pass minimum of 16 marks
- At the end of every semester, **Spoken English Viva Voce** will be conducted for all the students for 100 marks (four components) and the scores will be converted to 10 marks, with a required pass minimum of 4 marks
- To pass in any General English paper, a student must secure the pass minimum of 40 out of 100

| | | | |
|---|---|---|---|
| Distribution of marks: | **Written Exam** (100 marks) | | Converted to 40 marks |
| | **Viva voce** | (100 marks) | Converted to 10 marks |
| | **TOTAL** | **(40+10)** | **50 marks** |

**INTERNAL ASSESSMENT**

- Two Internal Examinations shall be conducted for 50 marks each along with the Continuous Internal Assessments for the Core and Allied courses.
- The internal assessment for the courses may include assignments, seminars, projects, tests, viva (any oral presentation), communication activities etc., focusing on skill development or / and the course content

**GENERAL ENGLISH**

**COURSE – I**

| **Hours: 6** | **Course Code: 23UGEL11** | **Credits: 3** |
|---|---|---|

**LEARNING OUTCOMES**

**LO1** To provide an ambience to acquire the basic language skills, listening, speaking, reading and writing
**LO2** To make the learners learn the basic elements of grammar
**LO3** To enable them to involve in basic communicative activities
**LO4** To develop basic vocabulary
**LO5** To help the learners comprehend and respond in English
**LO6** To build confidence in using English to communicate

| **UNIT** | **TOPICS** | |
|---|---|---|
| **I** | **POETRY**<br>Maya Angelou<br>Hilaire Belloc | <br>"Poor Girl"<br>"The Justice of Peace" |
| **II** | **PROSE**<br>A. P. J. Abdul Kalam<br>Madhavan Kutty | <br>"My Early Days"<br>"I Won't Let Him Go!" |
| **III** | **SHORT STORIES**<br>Oscar Wilde<br>Mulk Raj Anand | <br>"The Selfish Giant"<br>"The Lost Child" |
| **IV** | **LANGUAGE COMPETENCY**<br>1. Use of Verbs: Verb Grid (Positive, Negative & Question), Regular Verbs, Irregular Verbs & Modals<br>2. Tenses: Active Voice Tenses & Passive Voice Tenses<br>3. Use of Nouns: Forms of Personal Pronouns, Use of Nouns as Subject, Object, Complement and Object of the Preposition<br>4. Sentence Patterns: SV, SVO, SVC, SVA, SVOA, SVIODO<br>5. Punctuation and Capitalisation<br>6. Reading Comprehension (5 Anecdotes and 5 Wisdom Stories) | |
| **V** | **SPOKEN ENGLISH**<br>1. Reading Aloud (From the text) 2. Introducing oneself<br>3. Describing a place (With hints) 4. Describing a picture(With hints) | |

**COURSE OUTCOMES**

**CO1** Use grammatical structures in meaningful constructions
**CO2** Use oral communication for day-to-day activities
**CO**3 Use simple sentences for oral and written communication
**CO4** Use punctuation and capitalisation accurately
**CO5** Comprehend what they listen to, and respond to it at the primary level
**CO6** Read and appreciate simple stories and anecdotes

**TEXTBOOKS**


1. Board of Editors. *Spotlight I.* India: Ponnsai Publishers & Distributors, 2015.
2. *Oxford Elementary Learner's Dictionary*. Ed. Angela Crawley. Phonetics Ed. Michael Ashby. United Kingdom: Oxford University Press, 2021.
3. Board of Editors. *Active English Grammar and Composition.* India: Trinity Press, 2022.


**REFERENCE**


- Bhatnagar, R. P. ,*English for Competitive Examinations,* India: Trinity Press, 2017.
- Joseph K. V. , *A Textbook of English Grammar & Usage,* India: McGraw Hill Education 2015.
- Sinha, R. P. *Current English Grammar and Usage with Composition*. India: Oxford University Press, 2018.


| S. No. | QUESTION PATTERN | Marks |
|---|---|---|
| I | 3 Short essays (200 words each) out of 6 from Units I, II & III (3X10) | 30 |
| II | 5 Match the following from Units I, II & III | 05 |
| III | 5 Stating True or False from Units I, II & III | 05 |
| IV | Verb Grid (Positive, Negative & Question) | 20 |
| V | Tense Grid (Active & Passive) | 10 |
| VI | Noun as subject, object, complement & object of the preposition | 10 |
| VII | Sentence pattern | 10 |
| VIII | Punctuation & Capitalization | 05 |
| IX | Reading comprehension | 05 |
| | **Total** | **100** |

**GENERAL ENGLISH**

**COURSE – II**

| **Hours: 6** | **Course Code: 23UGEL22** | **Credits: 3** |
|---|---|---|

**LEARNING OUTCOMES**

**LO1** To provide an ambience to acquire the basic language skills, listening, speaking, reading and writing
**LO2** To make the learners frame questions and answers
**LO3** To enable them to involve in basic communicative activities
**LO4** To develop a comprehensible use of adjectives and adverbs
**LO5** To help the learners comprehend and respond in English
**LO6** To develop oral communication for day-to-day activities

| **UNIT** | **TOPICS** | |
|---|---|---|
| **I** | **POETRY**<br>Rabindranath Tagore<br>Gieve Patel | <br>"Leave this Chanting and Singing"<br>" On Killing a Tree" |
| **II** | **PROSE**<br>Leslie W. Leavitt<br>Sister Nivedita | <br>"Mahatma Gandhi"<br>"The Judgement Seat of Vikramaditya" |
| **III** | **SHORT STORIES**<br>O. Henry<br>Stephen Leacock | <br>"After Twenty Years"<br>"With the Photographer" |
| **IV** | **LANGUAGE COMPETENCY**<br>1. Use of Adjectives 2. Use of Adverbs<br>3. Use of Conditional 'If' (Probable & Improbable Conditions)<br>4. Use of 'who', 'which', 'where' & 'that' in combining sentences<br>5. Framing questions – 'Wh -' &'Yes' / 'No' Questions<br>6. Prefixes and Suffixes 7. Developing Hints into a Paragraph | |
| **V** | **SPOKEN ENGLISH**<br>1. Reading Aloud (from the Prescribed Text) 2. Introducing Others<br>3. Describing a Personality (from Hints) 4. Narrating a Story(from Hints) | |

**COURSE OUTCOMES**

CO1 Use grammatical structures in meaningful contexts
CO2 Use oral communication for day-to-day activities
CO3 Use simple sentences for oral and written communication
CO4 Use enhanced vocabulary
CO5 Comprehend and respond to what they listen to at the secondary level
CO6 Read and appreciate simple pieces of fiction and non-fiction

**TEXTBOOKS**

1. Board of Editors. *Spotlight II*.India: Ponnsai Publishers & Distributors, 2015.

2. *Oxford Elementary Learner's Dictionary*. Ed. Angela Crawley. Phonetics Ed. Michael Ashby.United Kingdom: Oxford University Press, 2021.

3. Board of Editors. *Active English Grammar and Composition.* India:Trinity Press, 2022.

**REFERENCE**


- Bhatnagar, R. P., *English for Competitive Examinations.* India: Trinity Press, 2017.
- Joseph K. V. *A Textbook of English Grammar & Usage,* India:McGraw Hill Education, 2015.
- Sinha, R. P. *Current English Grammar and Usage with Composition.* India: Oxford University Press, 2018.


| S. No. | QUESTION PATTERN | Marks |
|---|---|---|
| I | 3 Short Essays from Unit I, II and III | 30 |
| II | 5 True or False ( Units I, II and III) | 05 |
| III | 5 Match the Following (Unit I, II and III) | 05 |
| IV | Adding appropriate adjectives | 10 |
| V | Adding appropriate adverbs | 10 |
| VI | Framing Probable & Improbable Conditional Sentences | 10 |
| VII | Combining Sentences with 'who', 'where', 'which' &'that' | 10 |
| VIII | Framing 'Wh' &'Yes/No' Qns. | 10 |
| IX | Prefixes & Suffixes | 05 |
| X | Developing Hints to a Paragraph (100 words) | 05 |
| | **Total** | **100** |

**GENERAL ENGLISH**

**COURSE - III**

| **Hours: 6** | **Course Code: 23UGEL13, 23UGEL 33** | **Credits: 3** |
|---|---|---|

**LEARNING OUTCOMES**

**LO1** To involve the learners in reading and interpreting English in poetry and prose (Fiction and Non-fiction)

**LO2** To enable learners to write about prescribed literature

**LO3** To help learners develop vocabulary register

**LO4** To help learners learn the appropriate use of articles, prepositions and adverbs

**LO5** To facilitate in learners, the ability to create a narration based on hints

**LO6** To build confidence in the learners to speak English for specific purposes

| **UNIT** | **TOPICS** | |
|---|---|---|
| **I** | **POETRY**<br>William Shakespeare<br>P. B. Shelley<br>Oliver Goldsmith | "All the World's a Stage"<br>"Ozymandias"<br>"The Village Schoolmaster" |
| **II** | **SHORT STORIES**<br>A. J. Cronin<br>Stephen Leacock<br>Ernest Hemingway | "Two Gentlemen of Verona"<br>"The Conjuror's Revenge"<br>"A Day's Wait" |
| **III** | **PROSE & SHORT STORIES**<br>C. L. N. Prakash<br>O. Henry<br>Natsume Soseki | "Rethink Your Thinking"<br>"The Gift of the Magi"<br>"I am a Cat" |
| **IV** | **LANGUAGE COMPETENCY**<br>1. Homonyms, Homophones, Homographs 2. Articles<br>3. Prepositions 4. Adverbs<br>5. Constructing a story using hints | |
| **V** | **SPOKEN ENGLISH**<br>1. Reading aloud 3. Describing a picture<br>2. Describing a process 4. Personal Conversation (Habits, Hobbies, Future Plan) | |

**COURSE OUTCOMES**

**CO1** Read and understand English in poetry and prose (Fiction and Non-Fiction)

**CO2** Write coherent essays about prescribed literature

**CO3** Use words from acquired vocabulary register

**CO4** Use articles, prepositions and adverbs appropriately

**CO5** Create a narration from hints

**CO6** Speak English confidently in a descriptive as well as expository style

**TEXTBOOKS**

1. Board of Editors. *Spotlight III,* India: Ponnsai Publishers & Distributors, 2015.

2. Board of Editors. *Active English Grammar and Composition.* India: Trinity Press, 2022.

**REFERENCE**

- Bhatnagar, R. P. *English for Competitive Examinations.* India: Trinity Press, 2017.
- Joseph. K. V, *A Textbook of English Grammar & Usage,* India:McGraw Hill Education, *2015*
- Sinha, R. P. *Current English Grammar and Usage with Composition.* India: Oxford University Press, 2018.

| S. No. | QUESTION PATTERN | Marks |
|---|---|---|
| I | 1 Short Essay (200 words) out of 2 from Unit I | 10 |
| II | 1 Essay (300 words) out of 2 from Unit II | 15 |
| III | 1 Essay (300 words) out of 2 from Unit III | 15 |
| IV | 5 passages with 2 Qns. each (from Units I,II &III) | 10 |
| V | Homonyms, Homophones, Homographs | 10 |
| VI | Articles | 10 |
| VII | Prepositions | 10 |
| VIII | Adverbs | 10 |
| IX | Constructing a story | 10 |
| | **Total** | **100** |

**GENERAL ENGLISH**

**COURSE - IV**

| **Hours: 6** | **Course Code: 23UGEL14, 23UGEL24, 23UGEL44** | **Credits: 3** |
|---|---|---|

**LEARNING OUTCOMES**

**LO1** To make learners read and understand intermediate level poetry and prose

**LO2** To encourage learners to continue building a vocabulary register as the students interpret, speak and write about prescribed literature

**LO3** To enable learners fashion sentences to make paragraphs with unity of sense and structure

**LO4** To enable learners plan, organise ideas and write an essay

**LO5** To help learners learn the different types of letter, their structures and the use of appropriate language

**LO6** To make learners use grammatical structures in meaningful constructions

| **UNIT** | **TOPICS** | |
|---|---|---|
| **I** | **POETRY**<br>William Shakespeare<br>John Milton<br>Lewis Carroll<br>Nissim Ezekiel | <br>"Shall I Compare Thee"<br>"On His Blindness"<br>"The Walrus and the Carpenter"<br>"The Professor" |
| **II** | **PROSE**<br>Amitav Ghosh<br>Desmond Morris<br>Mark McCormack | <br>"The Town by the Sea"<br>"A Little Bit of What You Fancy"<br>"To Know When to Say It's None of Your Business" |
| **III** | **SHORT STORIES & DRAMA**<br>Aldous Huxley<br>Oscar Wilde<br>Fritz Karinthy | <br>"The Portrait"<br>"The Happy Prince"<br>"The Refund" |
| **IV** | **LANGUAGE COMPETENCY**<br>1. Tenses (with Verb Grid) 2. Concord 3. Describing a thing / a place / an event<br>4. Spotting Errors (Tenses and Concord) 5. Letter Writing (Personal & Official) | |
| **V** | **SPOKEN ENGLISH**<br>1. Reading Aloud 2. Issue based conversation<br>2. Speaking about prescribed literature 4. Speaking on a given topic | |

**COURSE OUTCOMES**

**CO1** Read, interpret and analyse intermediate level of English in poetry, prose and fiction

**CO2** Write coherent essays on prescribed literature

**CO3** Use the various tense forms accurately with proper subject - verb agreement
**CO4** Write descriptive paragraphs with unity of sense
**CO5** Identify common errors in the usage of Tenses and Concord
**CO6** Speak English fluently with confidence in an expository as well as analytical style

**TEXTBOOKS**

1. Board of Editors. *Spotlight IV*. India: Ponnsai Publishers & Distributors, 2015.
2. Board of Editors. *Active English Grammar and Composition.* India: Trinity Press, 2022.

**REFERENCE**

- Bhatnagar, R. P. *English for Competitive Examinations.* India: Trinity Press, 2017.
- Joseph K. V. *A Textbook of English Grammar & Usage,* India:McGraw Hill Education, *2015*
- Sinha, R. P. *Current English Grammar and Usage with Composition*, India: Oxford University Press, 2018.

| S. No. | QUESTION PATTERN | Marks |
|---|---|---|
| I | 1 Short Essay (200 words) out of 2 from Unit I | 10 |
| II | 1 Essay (300 words) out of 2 from Unit II | 15 |
| III | 1 Essay (300 words) out of 2 from Unit III | 15 |
| IV | 5 passages with 2 Qns. each (from Units I, II & III) | 10 |
| V | Tenses | 10 |
| VI | Concord | 10 |
| VII | Describing a thing / a place / an event | 10 |
| VIII | Spotting Errors | 10 |
| IX | Letter Writing | 10 |
| | **Total** | **100** |

**GENERAL ENGLISH**

**COURSE – V**

| Hours: 6 | Course Code: 23UGEL25, 23UGEL35 | Credits: 3 |
|---|---|---|

**LEARNING OUTCOMES**

**LO1** To introduce learners to intermediate level of English through prescribed d literature

**LO2** To make learners read, interpret and write about prescribed pieces of literature

**LO3** To make learners learn complex language structures and appropriate use of conjunctions

**LO4** To help learners become familiar with the accurate use of language with an awareness of common errors in language use

**LO5** To make learners understand the logical sequence of ideas within a paragraph

**LO6** To make learners speak English fluently with confidence and accuracy for specific purposes

| UNIT | TOPICS | |
|---|---|---|
| I | **POETRY**<br>William Wordsworth<br>Robert Frost<br>Mina Assadi<br>H.W. Longfellow<br>Philip Larkin | <br>"The Solitary Reaper"<br>"The Road Not Taken"<br>"A Ring to Me Is Bondage"<br>"A Slave's Dream"<br>"Next Please" |
| II | **PROSE, DRAMA AND SHORT STORY** | |
| | Dr. Radhakrishnan<br>Collins & Lapiere<br>Oscar Wilde<br>Somerset Maugham<br>A. A. Milne | "Humanities Vs Sciences"<br>"The Second Crucifixion"<br>"The Model Millionaire"<br>"The Ant and the Grasshopper"<br>"The Boy Comes Home" |
| III | **LANGUAGE COMPETENCY (Grammar & Vocabulary)**<br>1. Words often confused<br>2. Synonyms and Antonyms<br>3. Synthesis and Transformation of Sentences (Simple, Compound & Complex)<br>4. Conjunctions<br>5. Active - Passive Voice | |
| IV | **LANGUAGE COMPETENCY (Composition)**<br>1. Expansion of Ideas / Proverbs<br>2. Sentence Arrangement<br>3. Dialogue Writing | |
| V | **SPOKEN ENGLISH**<br>1. Reading and Interpreting 2. Turncoat<br>3. Expand a Proverb 4. Issue Based Conversation | |

**COURSE OUTCOMES**

**CO1** Read, interpret and analyse poetic English to understand open possibility of inferences

**CO2** Write logically planned essays to address specific questions concerning prescribed literature

**CO3** Understand the forms and structural differences in different types of sentences and their specific purposes

**CO4** Use complex language structures with appropriate conjunctions

**CO5** Use vocabulary actively with an awareness of homonyms, homophones, synonyms and antonyms

**CO6** Use Spoken English fluently with confidence and accuracy for specific purposes such as analytical, argumentative and expository talks

**TEXT BOOKS**

1. Board of Editors. *Spotlight V,* India:Ponnsai Publishers & Distributors, 2015.
2. Board of Editors. *Active English Grammar and Composition.* India:Trinity Press, 2022.

**REFERENCE**

- Bhatnagar, R. P. *English for Competitive Examinations*, India: Trinity Press, 2017.
- Joseph K. V. *A Textbook of English Grammar & Usage,* India: McGraw Hill Education*, 2015*
- Sinha, R. P. *Current English Grammar and Usage with Composition*, India: Oxford University Press, 2018

| S. No. | QUESTION PATTERN | Marks |
|---|---|---|
| I | 1 Short Essay (200 words) out of 2 from Unit I | 10 |
| II | 1 Essay (300 words) out of 2 from Unit II | 15 |
| III | 5 passages with 2 Qns. each (from Units I, II & III) | 10 |
| IV | Vocabulary | 15 |
| V | Synthesis of sentences | 10 |
| VI | Transformation of sentences | 05 |
| VII | Active - Passive Voice | 10 |
| VIII | Conjunction | 05 |
| IX | Expansion of Ideas / Proverbs (2x5=10) | 10 |
| X | Sentence Arrangement | 05 |
| XI | Dialogue Writing | 05 |
| | **Total** | **100** |

**GENERAL ENGLISH**

**COURSE - VI**

| **Hours: 6** | **Course Code: 23UGEL36, 23UGEL46** | **Credits: 3** |
|---|---|---|

**LEARNING OUTCOMES**

**LO1** To introduce learners to advanced level of poetic English through representative pieces, to make them understand oblique use of language

**LO2** To make them read and understand modern English prose through samples of biography, autobiography, short story and one act play

**LO3** To familiarise them with advanced language structures and the use of idioms and phrasal verbs

**LO4** To make them understand and use different degrees for comparison and use language for reporting speech

**LO5** To acquaint them with the skills of expanding or developing, and condensing ideas

**LO6** To make them speak English fluently and accurately for specific purposes

| **UNIT** | **TOPICS** | |
|---|---|---|
| **I** | **POETRY**<br>Edwin Arnold<br>Sylvia Plath<br>John Keats<br>John Donne<br>Maya Angelou | <br>"Siddhartha"<br>"The Mirror"<br>"La Belle Dame Sans Merci"<br>"Death Be Not Proud"<br>"I Know Why the Caged Bird Sings" |
| **II** | **PROSE, SHORT STORY & DRAMA**<br>Anne Frank<br>C.P. Snow<br>Chinua Achebe<br>Hugh Chesterton | <br>"The Diary of a Young Girl"<br>"Hardy and Ramanujan"<br>"Marriage is a Private Affair"<br>"The Pie and the Tart" |
| **III** | **LANGUAGE COMPETENCY (Grammar and Vocabulary)**<br>1. Degrees of Comparison 2. Direct- Indirect Speech<br>3. Cloze Test. 4. Idioms and Phrasal verbs<br>5. Spotting Errors | |
| **IV** | **LANGUAGE COMPETENCY (Composition)**<br>1. Précis Writing 2. Essay Writing | |
| **V** | **SPOKEN ENGLISH**<br>1. Reading and Interpretation 2. Issue Based Conversation<br>3. Public Speaking on subject topic 4. Extempore | |

**COURSE OUTCOMES**

**CO1** Read and interpret the oblique language of poetry and write appreciative essays on the prescribed literature

**CO2** Read, interpret and write analytical essays about prescribed prose pieces

**CO3** Use advanced grammar structures to report speech and use the three degrees of comparison for intended emphasis

**CO4** Use advanced nuances of language such as idioms and phrasal verbs

**CO5** Write reflective, descriptive, expository and imaginative essays with appropriate content, and condense material to a précis

**CO6** Use English fluently and accurately for public speaking, extempore and other specific purposes

**TEXT BOOKS**

- Board of Editors. *Spotlight VI*, India: Ponnsai Publishers & Distributors, 2016.
- Board of Editors. *Active English Grammar and Composition*, India: Trinity Press, 2022

**REFERENCE**

- Bhatnagar, R. P. *English for Competitive Examinations,* India: Trinity Press, 2017.
- Joseph K. V. *A Textbook of English Grammar & Usage,* India: McGraw Hill Education, 2015
- Sinha, R. P. *Current English Grammar and Usage with Composition*. India: Oxford University Press, 2018.

| S. No. | QUESTION PATTERN | Marks |
|---|---|---|
| I | 1 short essay (200 words) out of 2 from Unit I | 10 |
| II | 1 essay (300 words) out of 2 from Unit II | 15 |
| III | 5 Passages with 2 Qns. each (from Units I & II) | 10 |
| IV | Degrees of Comparison | 05 |
| V | Direct Indirect Speech | 10 |
| VI | Making sentences – Idioms | 05 |
| VII | Phrasal verbs | 05 |
| VIII | Spotting errors ( Multiple Choice ) | 10 |
| IX | Correcting the errors (Rewriting) | 05 |
| X | Cloze Test | 05 |
| XI | Precis Writing | 10 |
| XII | Essay Writing | 10 |
| | **Total** | **100** |

**GENERAL ENGLISH**

**COURSE - VII**

| Hours: 6 | Course Code: 23UGEL47 | Credits: 3 |
|---|---|---|

**LEARNING OBJECTIVES**

**LO1** To facilitate learners' reading advanced English through representative pieces of Literature

**LO2** To help learners infer and interpret prescribed literature and write coherent, Analytical essays

**LO3** To help learners acquire the advanced use of English for professional purposes

**LO4** To help learners prepare resume and CVs for professional use

**LO5** To encourage learners in using English skillfully and creatively to discuss, brainstorm or debate a topic, through active practice

**LO6** To equip learners with the soft skills necessary for employability

| | |
|---|---|
| **I** | **DRAMA**<br>William Shakespeare *Julius Caesar* |
| **II** | **FICTION**<br>Charles Dickens *Oliver Twist* |
| **III** | **SOFT SKILLS 1 (Theory and Practice)**<br>1.Interview skills* 2. Group Discussion*<br>3.Debate 4. Interpersonal Skills<br>* Included for Spoken English Viva Voce also |
| **IV** | **SOFT SKILLS 2 (Theory and Practice)**<br>1. Time Management 2. Problem Solving Techniques<br>3. Teamwork 4. Leadership |
| **V** | **APPLICATION & RESUME**<br>1. Chronological Resume. 2. Functional Resume<br>3. Responding to the given advertisement |

**COURSE OUTCOMES**

**CO1** Read and understand advanced forms of English in Literature

**CO2** Interpret and write analytical essays on topics concerning prescribed pieces of literature

**CO3** Speak English fluently and accurately in professional contexts

**CO4** Prepare application with appropriate Resume structure for employment

**CO5** Use English effectively and creatively for interview, group discussion etc.,

**CO6** Behave, react and handle situations connected to employability, using the acquired knowledge of soft skills

**TEXT BOOKS**

- Shakespeare, William. *Julius Caesar,* United Kingdom: Oxford University Press, 2008.
- Dickens, Charles. *Oliver Twist*, United Kingdom: Penguin Classics, 2003

**REFERENCE**

- Bhatnagar, R. P. *English for Competitive Examinations.* India: Trinity Press, 2017.
- Joseph K. V. *A Textbook of English Grammar & Usage,* India: McGraw HillEducation, 2015
- Sinha, R. P. *Current. English Grammar and Usage with Composition*, India: Oxford University Press, 2018.

| S. No. | QUESTION PATTERN | Marks |
|---|---|---|
| I | 5 Multiple Choice Questions from Unit I | 05 |
| II | 5 Multiple Choice Questions from Unit II | 05 |
| III | 1 Essay (400 words) out of 3 from Unit I | 15 |
| IV | 1 Essay (400 words) out of 3 from Unit II | 15 |
| V | 2 Annotations out of 3 from Unit I | 10 |
| VI | 2 Paragraphs out of 3 from Unit II | 10 |
| VII | 1 Essay out of 2 from Unit III | 15 |
| VIII | 1 Essay out of 2 from Unit IV | 15 |
| IX | Responding to the given Advertisement | 10 |
| | **Total** | **100** |

**DEPARTMENT OF HUMAN EXCELLENCE**

**St. Xavier's College (Autonomous), Palayamkottai**

**Courses offered**

| Semester | Category | Course Code | Course Title |
|---|---|---|---|
| I | FC | 23UHER11/<br>23UHEE11 | Religion: Catholic Doctrine /<br>Ethics |
| II | SEC3 | 23UHEI21 | Integrated Personality Development |
| III | SEC4 | 23UHEL31 | Life Coping and Entrepreneurial Skills Management |
| IV | EVS | 23UEVS41 | Environmental Studies |
| V | VE | 23UVEH51 | Human Rights and Social Analysis |

**NME**

| Semester | Category | Course Code | Course Title |
|---|---|---|---|
| I | Library | 23ULBN11 | Foundations of Library Science |
| I | XRF | 23UXRN11 | Traditional Knowledge of Indian Medicinal Systems |
| II | Library | 23ULBN21 | Information Resources |
| II | XRF | 23UXRN21 | Indian Traditional Medicinal Foods |
| III | XRF | 23UXRN31 | Food Microbiology |
| IV | XRF | 23UXRN41 | Herbal Resources and Their Conservation |
| IV | MAX Forum | 23UMXN41 | Society, Economy and Politics in Contemporary India |

**Common Question Pattern**

Internal Test

| | | |
|---|---|---|
| Part A | Answer ALL the questions in one or two lines | 5 x 2 = 10 |
| Part B | Answer ALL the questions, each in a paragraph | 3 x 5 = 15 |
| Part C | Write an essay on the following | 1 x 10 = 10 |

Semester Exam

| | | |
|---|---|---|
| Part A | Answer ALL the questions in one or two lines | 10 x 3 = 30 |
| Part B | Answer ALL the questions, each in a paragraph | 5 x 8 = 40 |
| Part C | Write an essay on each the following | 2 x 15 = 30 |

**RELIGION: CATHOLICDOCTRINE**
**(23UHER11)**

| SEMESTER:I | VE | HOURS:2 | CREDITS: 2 | TOTALHOURS:30 |
|---|---|---|---|---|

**Course Outcomes:**

Upon completion of the course the students will be able to

1. Recite the Sacraments(K1)
2. Identify the challenges of the present day church(K1)
3. Associate Old and New testaments of the bible(K2)
4. Explain the Church history(K2)
5. Discuss the Marian worship (K2)
6. Summarize the catholic social teachings(K2)

**Unit I: Introduction to Bible (6 Hours)**

Bible as a Word of God, its inspiration, the Canon - Old and New Testaments and their interconnectedness - Traditional and modern interpretations

**Unit II: Introduction to the Church history (6Hours)**

The beginnings of the Church - Medieval period and its challenges - The importance of the Second Vatican Council and their decrees - Synodality

**Unit III: Introduction to the Sacraments (6Hours)**

The origin of the seven sacraments - Their practices and meanings - History of thesacraments

**Unit IV: Introduction to Mariology (6Hours)**

Mary, Mother of God and Jesus - Mary, our Mother and in the Gospels - Mariology in the history of the Church – Mary as a Prophet of revolution

**Unit V: Church in the Contemporary World (6Hours)**

The challenges of the present day Church – Casteism and Same sex marriage – Ecumenical unity and Inter Religious harmony - Catholic Social Teachings

**REFERENCES**:


1. Paul C. Jesuraj, Growing in Your Faith, July 2022.
2. Second Vatican Council Documents

**ETHICS**
**(23UHEE11)**

| SEMESTER: I | VE | HOURS: 2 | CREDITS: 2 | TOTAL HOURS: 30 |
|---|---|---|---|---|

**Course Outcomes :**

Upon completion of the course the students will be able to

- Describe the Ethical foundations and human history (K1)
- Identify Ethics and its relationship with Religions (K1)
- List the personal ethical codes to be practices in day to day life (K1)
- Associate ethics in family and society (K2)
- Summarize modern ethical issues and problems (k2)
- Discuss bio and environmental ethics (k2)

**Unit I : Introduction to Ethics** **(6 Hours)**

Meaning, Nature and Scope of Ethics - Challenges and Importance of ethics - Basic Ethical Foundations

**Unit II : Ethics in Religions** **(6 Hours)**

Ethical foundations and meanings in big and small traditions - Ethics and its relationship with Religions

**Unit III : Personal Ethics** **(6 Hours)**

Moral precepts - Dynamics of personal morality - Moral Conscience - Ethical aspects of Thirukural – Evils of Corruption – Gandhi's Seven Deadly Sins.

**Unit IV : Family Ethics and Social Ethics** **(6 Hours)**

Role of Family in ethical formulations- Respecting persons - Peace and Justice - Human Duties

**Unit V : Modern Ethical Issues** **(6 Hours)**

Bio Ethics - Media Ethics - Environmental Ethics –Cyber Ethics

**REFERENCES**:


1. Ethics prepared by School of Interdisciplinary and Trans-disciplinary Studies, Indira Gandhi National Open University (MPYE 002)
2. Course material prepared by the Department of Human Excellence.

**INTEGRATED PERSONALITY DEVELOPMENT**
**(23UHEI21)**

| SEMESTER: II | SEC3 | HOURS: 2 | CREDITS: 2 | TOTAL HOURS: 30 |
|---|---|---|---|---|

**Course Outcomes:**

Upon completion of the course the students will be able to

- Identify personal strengths and weaknesses (K1)
- Identify the means of self-esteem (K1)
- Identify the means of improving personal performance(K1)
- Explain the techniques of self-management(K2)
- Describe coping strategies of learning (K2)
- Discuss the traits of personal competence(K2)
- Summarize different dimensions of Personality (K2)

**UNIT I: Self – Knowledge** **(6 Hours)**

Exploring habits, attitudes, preferences and experience –SWOC analysis – Johari Window – Enhancing one's self image, self-esteem, self confidence

**UNIT II: Self-Management** **(6 Hours)**

Understanding of life story - Focusing on Internal narratives - Managing change, confusion and uncertainty –Goal setting – Personal Vision and Mission statements

**UNIT III: Personal Competence and Maturity** **(6 Hours)**

Motivation - Developing rapport - Giving and receiving constructive criticism - Assertiveness and negotiation skills – Leadership – Type of Leadership – Qualities of a good leader

**Unit IV: Dimensions of Personality Development** **(6 Hours)**

Recognizing the gradual growth in different dimension of one's personality such as (a) Physical (b) Intellectual (c) Emotional (d) Moral (e) Social and (f) Spiritual - Learning the Development process; Tools and Skills - Helping to maximize one's potentials

**Unit IV**: **Academic Learning Strategies** **(6 Hours)**

Memory - Art of generative listening, learning and writing - Note making - Presentation skills - Time management - Receptive skills - Classroom etiquettes - Cyber knowledge

**REFERENCE BOOKS:**


1. Dr. Xavier Alphonse S.J., We Shall Overcome, ICRDEC Publications, Chennai, 2004.
2. Personality Development, Harold R. Wallace and L. Ann Masters, South-Western, Cengage Learning India PL, New Delhi, 2006.
3. Course material prepared by the Department of Human Excellence

**LIFE COPING AND ENTREPRENEURIAL SKILLS MANAGEMENT**
**(23UHEL31)**

| SEMESTER: III | SEC4 | HOURS: 2 | CREDITS: 2 | TOTAL HOURS: 30 |
|---|---|---|---|---|

**Course Outcomes :**

Upon completion of the course, the students will be able to

1. Identify the various challenges faced in adolescence (K1)
2. Tabulate healthy habits and lifestyle (K1)
3. Identify problem solving strategies (K1)
4. Discuss family and professional relationship(K2)
5. Explain cognitive, emotional and behavioural perspectives (K2)
6. Describe evils of addiction and the remedies available (K2)

**Unit I: Physical AND Mental Wellbeing (6 Hours)**

Adolescent Health and Holistic Health - Understand and appreciate physical Self - Personal hygiene and grooming - Balanced diet - Healthy habits and lifestyle - Sound body and mind - Nurturing health at home, in campus –Definition of Health - Women health – various medicine systems

**Unit II: Interpersonal and Social Wellbeing (6 Hours)**

Family Relationship: Values in family relationship, Nuclear, Joint Family, Dependence, Overdependence, Happy family, Broken Family - Caring Elders - Rapport Building with Peers/ Friends, Strangers, Transgenders - Professional Relationship : Officials, Mentors, Staff & Service Personnel- Other centeredness and others point of view and Empathy

**Unit III: Problem-solving and Decision making skills (6 Hours)**

Decision making processes - Lateral Thinking and problem-solving strategies - Select and apply problem-solving strategies to more complex tasks and problems - Gain familiarity with concepts such as performance indicators and benchmarking – Counseling.

**Unit IV: Coping Strategies (6 Hours)**

Conflict/Crisis Management –Stress Management – Emotional Management - Team, Task and Resource Management – Ignatian Discernment Process

**Unit V: Overcoming Addiction (6 Hours)**

Various stages of addiction- Gadgets addiction - Substance abuse - Media addiction – Internet addiction – Impact, prevention and remedies.

**REFERENCE BOOKS:**


1. Dr. Xavier Alphonse S.J., We Shall Overcome, ICRDEC Publications, Chennai, 2004.
2. Covey Sean, Seven Habits of Highly Effective Teens, New York, Fireside Publishers, 1998.
3. Carnegie Dale, How to win Friends and Influence People, New York: Simon & Schuster, 1998.
4. Course Material prepared by the Department of Human Excellence.

**ENVIRONMENTAL STUDIES**
**(23UEVS41)**

| SEMESTER: IV | EVS | HOURS: 2 | CREDITS: 2 | TOTAL HOURS: 30 |
|---|---|---|---|---|

**Course objective:**

To cater to students from diverse disciplinary backgrounds and to sensitise them about the commitment of our nation towards achieving sustainable development goals and addressing global environmental challenges.

**Course outcomes:**

The student will be able to:

1. Describe various natural resources and the need for sustainable development (K1).
2. Relate biodiversity and its conservation approaches (K2).
3. Solve the environmental issues of concern and discover prevention strategies (K3).
4. Sensitize and categorize the adverse health impacts of pollution (K3).
5. Assess environmental quality and risks for climate change mitigation (K4 & K5).
6. Recognize the major treaties to safeguard Earth's environment and resources (K2).

**Unit I: Natural Resources and Sustainable Development (6 hours)**

Overview of natural resources: definition, classification. Biotic resources: major types, status and challenges. Water resources: types, over-exploitation, issues, challenges, water scarcity, conflicts. Soil and mineral resources: important minerals, problems, soil as a resource. Energy resources: sources, conventional and non-conventional, implications. Introduction to sustainable development: SDGs, targets and indicators, challenges and strategies.

**Unit II: Conservation of Biodiversity and Ecosystems (6 hours)**

Biodiversity and its distribution: Levels and types, India and world, hotspots, threat categories. Ecosystems and ecosystem services: major types in India, basic characteristics, significance. Threats to biodiversity and ecosystems: land use, commercial exploitation of species and invasive species. Major conservation policies: in situ, ex situ, protected areas, traditional knowledge, community based conservation, gender and conservation.

**Unit III: Environmental Pollution and Health (6 hours)**

Understanding disaster and pollution: definitions, natural and man-made, point source and non-point source, kinds. Air and water pollution: criteria pollutants, sources, and adverse effects, quality standards. Soil and noise pollution: sources and health effects. Thermal and radioactive pollution: sources and impact on health and ecosystems.

**Unit IV: Climate Change: Impacts, Adaptation and Mitigation (6 hours)**

Understanding climate change: structure of atmosphere, natural and anthropogenic variations, importance of 1.5 °C and 2.0 °C limits to global warming, projections of climate change in Indian subcontinent. Impacts, vulnerability and adaptation to climate change. Mitigation of climate change: GHG reduction vs. sink enhancement, concept of carbon intensity, energy intensity and carbon neutrality; policy instruments, carbon capture and storage, climate justice.

**Unit V: Environmental Treaties and Legislation (6 hours)**

Overview of instruments of international cooperation: bilateral, multilateral, conventions and protocols, COPs. Major International Environmental Agreements: CBD, CITES, UNCCD, UNFCCC. Major Indian Environmental Legislations: acts, rules, sites, areas, zones and judgements. Major International organisations and initiatives: UNEP, IUCN, WCED, UNESCO, IPCC, MAB.

**Reference books**


1. Singh, J.S., Singh, S.P., Gupta, S.R. (2006). Ecology, Environment and Resource Conservation. Anamaya Publications.
2. Harris, Frances (2012). Global Environmental Issues, 2nd Edition. Wiley- Blackwell.
3. Krishnamurthy, K.V. (2003). Textbook of Biodiversity, Science Publishers, Plymouth, UK.
4. Ahluwalia, V. K. (2015). Environmental Pollution, and Health. The Energy and Resources Institute (TERI).
5. Pittock, Barrie (2009). Climate Change: The Science, Impacts and Solutions. 2nd Edition. Routledge.
6. Ministry of Environment, Forest and Climate Change (2019). A Handbook on International Environment Conventions & Programmes.
7. KanchiKohli, Manju Menon (2021). Development of Environment Laws in India, Cambridge University Press.

**HUMAN RIGHTS AND SOCIAL ANALYSIS**
**(23UVEH51)**

| SEMESTER: V | VE | HOURS: 2 | CREDITS: 2 | TOTAL HOURS: 30 |
|---|---|---|---|---|

**Course Outcomes :**

Upon completion of the course, the students will be able to

- Describe Indian social scenario (K1)
- List the different kinds of fundamental rights (K1)
- Discuss major social problems in India (K2)
- Analyze critically society and its network of relationships (K4)
- Analyze local and global social problems (K4)
- Describe redressal mechanisms for human rights violations (K6)

**Unit I: World trends today and Indian Scenario (6 Hours)**
Some basic data – Globalization - World Social Forum vs World Economic Forum - The North South divide – Democracy - Types of Governance in the world – Demography and Basic Data of India

**Unit II: IndianSocial System (6 Hours)**
Social Analysis - Social system and its components - Interdependence of human being and society - A land of cultural linguistic and religious diversity - secularism-communalism-fundamentalism-Indian politics and religion-problems of the minority.

**Unit III: Major Social Problems I (6 Hours)**
Indian Economic inequality and Poverty; Manifestation and Measurement; Incidence and Magnitude; Causes, problems of poor and pains of poverty; the remedy - Ignorance in Governance and corruption: The Concept; Causes and Impact of Corruption; Combating Corruption - Illiteracy:Magnitude, Causes and Consequences

**Unit IV: Major Social Problems II (6 Hours)**
Caste Discrimination: caste discrimination and process of exclusion, Honour Killing, Untouchability, Caste Politics, Reservation policy –Dalit Empowerment - Child abuse, child labour - Effects of Abuse on Children - Violence against women: Harassment; Nature, Extent and Characteristics– Empowerment of Women - LGBTQIA+ – Currently pressing issues.

**Unit V: Human Rights, Indian Constitutionsand Empowerment (6 Hours)**
Universal Human Rights: The concept – Evolution – Organizations and Recent Developments – Indian Constitutions: Preamble - Political and Civil fundamental rights and duties. Empowerment Models: Communitarian and Local Models – Social Reformers: Ambedkar, Gandhi, Muthulakshmi Reddy and Periyar - Dreams and hopes for better India.

**REFERENCE BOOKS:**


1. P.N. Sharma, “Social problems and issues in India”, Bharat Book Centre, 2014
2. New India, The Reality Reloaded, Gurjot S. Kaler, Chandigarh, India, 2018
3. Course Material Prepared by the Department of Human Excellence

**FOUNDATIONS OF LIBRARY SCIENCE**
**(23ULBN11)**

| SEMESTER: I | NME | HOURS: 2 | CREDITS: 2 | TOTAL HOURS: 30 |
|---|---|---|---|---|

**COURSE Outcomes:** At the end of the course the students will be able to

CO1. Comprehend the Evolution, Significance, and Fundamental Operations of Libraries. (K2)
CO2. Develop Effective Reading Strategies and Critical Thinking Skills. (K3)
CO3. Differentiate and grasp the distinct roles and functions of various types of libraries. (K4)
CO4. Explore Modern Library Services and the Impact of Digital Resources. (K4)
CO5. Recognize the potential of VR, AI, and chatbots in enhancing user support within library environments. (K5)

**UNIT 1** **(6 Hours)**

**INTRODUCTION TO LIBRARY**

The history and evolution of libraries - Need - Purpose - Functions - Five Laws of Library Science.

**UNIT 2** **(6 Hours)**

**TYPES OF LIBRARY**

Public – Academic – Special - National. (Definition, purpose and functions of each type of library.

**UNIT 3** **(6 Hours)**

**LIBRARY SERVICES AND COLLECTION DEVELOPMENT**

Reference services and reader advisory- Collection development and Management - E-books - E-journals Database - Bulletin Boards.

**UNIT 4** **(6 Hours)**

**EMERGING TECHNOLOGIES IN LIBRARIES**

Virtual reality and augmented reality in libraries - AI and chatbots for user support - Internet of Things (IoT) applications in libraries.

**UNIT 5** **(6 Hours)**

**READING CULTURE FOR LIBRARY PRACTITIONERS**

Value of Reading in Professional Development - Exploring Diverse Reading Materials - Effective Reading Techniques - Critical Thinking and Reflection.

**Text Book**

Kumar P S G, Foundations of Library and Information Science B. R. Publishing Corporation

**Reference**

**1.** Khanna J K, Library and Society, Kurukshetra University, Kurukshetra
**2.** Kumar P S G, Foundation of Library and Information Science Paper 1 of UGC Model Curriculum, B.R. Publishing Corporation

**TRADITIONAL KNOWLEDGE OF INDIAN MEDICINAL SYSTEMS**
**(23UXRN11)**

| SEMESTER: I | NME | HOURS: 2 | CREDITS: 2 | TOTAL HOURS: 30 |
|---|---|---|---|---|

**Course outcomes:** At the end of the course the students will be able to

**CO1:** Understand the concepts of ethno botany and its branches (K1).
**CO2:** Provide a strong foundation in the principles of ethno medicine and its applications (K2 & K4).
**CO3:** Inculcate knowledge and make the students aware of the commercial value of medicinal plants (K2 & K3).
**CO4:** Give an insight into the edible and medicinal plants in tribal medicine (K3).
**CO5:** Comprehend the advances made in the field of plant biotechnology in conservation of medicinal plant resources (K4).
**CO6:** Understand ethno botany of the Western Ghats, their medicinal and commercial values and conservation (K1- K4).

**Unit I: Ethnobotany (6 hours)**

History of Ethnobotany, concept, scope and objectives. The relevance of ethnobotany in the present context. Major ethnic groups in Tamil Nadu.

**Unit II: Traditional medicines (6 hours)**

Medicinal plants used by Tribals. Ethnobotanical formulations; Ethnobotanical uses of selected medicinal plants with a) *Azadiracthaindica b) Ocimumtenuiflorum c) Vitexnegundo. d) Gloriosasuperba e) Tribulusterrestris f) Pongamiapinnata g) Senna auriculata h) Indigoferatinctoria*. Importance and scope of medicinal plants used by *Paliyans*.

**Unit III: Commercial value of traditional medicinal plants (6 hours)**

Raw drugs from ethnomedicinal plants - Economic potentials of selected ethnomedicinal plants. Ethnobotany as a source of important drugs a) Reserpine b) Artemisin c) Gugulipid d) Cathranthin e) Strychnine. Export of medicinal plants and their products.

**Unit IV: Collection, Utilization and Conservation of Traditional Medicinal Plants (6 hours)**

The significance of wild medicinal plants – Collection and utilization of medicinal plants – Therapeutics uses of wild medicinal plants. Role of ethnic groups in the conservation of plant genetic resources. Participatory forest management.

**Unit V: Conventional and modern aspects of medicinal plant propagation (6 hours)**

Plant Propagation; Methods of propagation – conventional - vegetative cutting, layering grafting etc., Modern methods- Tissue culture; Micropropagation, isolation of secondary metabolites from *in vitro* culture

**Textbooks:**


1. P.C. Trivedi, Dr. Pravin Chandra 2011. Text Book of Ethnobotany, Pointer Publishers.
2. Bir Bahadur, K. V. Krishnamurthy, T. Pullaiah. 2021. Ethnobotany of India, 5-Volume Set. Apple Academic Press
3. Jain, A. and Jain, S.K. 2016. Indian Ethno botany - Bibliography of 21st Century Scientific Publishers (India).
4. Cunningham, A. B. (2001). Applied Ethnobotany. Earthscan publishers Ltd. London & Sterling
5. Indian Medicinal Plants -An Illustrated Dictionary-C.P. Khare (Ed.) 2019, ©Springer Science+Business Media, LLC.


**Reference Books**


1. Paul E. Minnis 2000. Ethnobotany: A Reader. University of Oklahoma Press
2. Gary J. Martin, 2014. Ethnobotany A Methods Manual. Springer US.
3. T. Pullaiah, Bir Bahadur, K. V. Krishnamurthy. 2016. Ethnobotany of India Western Ghats and West Coast of Peninsular India. Apple Academic Press
4. Ministry of Environment and Forests. 1994. Ethno biology in India. A Status Report. All India Coordinated Research Project on Ethno biology. Ministry of Environment and Forests. New Delhi
5. Albuquerque, U.P., Ramos, M.A., Júnior, W.S.F., and De Medeiros, P.M. 2017. Ethnobotany.


**Web Resources**

- https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2816487/
- https://www.wipo.int/edocs/pubdocs/en/wipo_pub_tk_6.pdf
- https://main.ayush.gov.in/ayush-systems/ayurveda/faq
- https://www.who.int/news
- https://www.csir.res.in/documents/tkdl
- https://www.meity.gov.in/content/national-digital-library

**INFORMATION RESOURCES**
**(23ULBN21)**

| SEMESTER: II | NME | HOURS: 2 | CREDITS: 2 | TOTAL HOURS: 30 |
|---|---|---|---|---|

**Course Outcomes:** Upon completion of the course, the students will be able to

CO1. learn all kinds of Secondary Sources. (K1)
CO2. Learn electronic reference materials. (K1)
CO3. Understand the concept and importance of Primary, Secondary and Tertiary sources (K2)
CO4. Analyze the different Non Documentary Sources (K4)
CO5. Assess electronic information sources, including e-books and e-journals. (K4)

**UNIT-I : Introduction to Information Sources (6 Hours)**

Definition, Type, Characteristics - Primary, Secondary, Tertiary –Evaluation of print Reference Sources

**UNIT-II: Secondary Sources (6 Hours)**

Definition, Types- Dictionaries, Encyclopedia, Directories, Manuals and Handbooks, Bibliographic sources

**UNIT-III : Non – Documentary Source (6 Hours)**

Formal and Informal – Human Sources, Institutional Information Sources, Technological Gate Keepers and Invisible Colleges.

**UNIT-IV : Electronic Information Sources (6 Hours)**

Meaning- Characteristics- Research database Open Access Resources-Audio resources

**UNIT-V: Online Publishers (6 Hours)**

Detailed study of E-books (Amazon, Sage Publication), E-journals (Springer, Verlog), Database (PROQUEST, EBSCO), Evaluation of E-Resources.

**Reference Books:**


- Singh, G. (2011).Digital libraries and digitization. EssEss Publications.
- 2. Baby M.D. (2000) Peter Clayton, G. E. Gorman. Managing Information Resources in Libraries. Cambridge Publishers.

**INDIAN TRADITIONAL MEDICINAL FOODS**
**(23UXRN21)**

| SEMESTER: II | NME | HOURS: 2 | CREDITS: 2 | TOTAL HOURS: 30 |
|---|---|---|---|---|

**Course outcomes:** At the end of the course the students will be able to

**CO1:** Know the foundational principles of health supplements such as functional foods, nutraceuticals, superfoods, etc., and assess their potential within the market context (K1).
**CO2:** Understand thecore principles of nutrition, including carbohydrates, proteins, lipids, vitamins, minerals, health-enhancing phytochemicals, and antinutritional factors (K2).
**CO3**: Get knowledge about the origins, traditional uses, nutritional composition, and health advantages of selected plant-based foods (K1).
**CO4**: Know the scientific rationale underlying the health benefits and potential adverse effects of various food substances (K3).
**CO5**: Identify the indigenous wild edible plants found in the Southern Western Ghats and their role in enhancing food security (K1).
**CO6:** Comprehend the fundamental concepts related to food and its significance in promoting health, specifically addressing contemporary health challenges, and demonstrate the ability to apply this knowledge in daily life (K1-K3).

**Unit I: FOOD CULTURE** (**6 Hours)**
Concept of food and its medicinal value - Food and health in Indian traditional medicine - Effect of globalization on food culture - Fast foods, Junk foods and their impact on the health of children and youth population - Emerging trends in health supplements

**Unit II: MACRONUTRIENTS** (**6 Hours)**
Carbohydrates and their role in health - Cereals, Millets, and Pseudo - Cereals - Proteins and their importance on health -Pulses and their health benefits - Lipids and their health impacts - Nuts and oil seeds

**Unit III: MICRONUTRIENTS** (**6 Hours)**
Vitamins, minerals and their health impacts - Hidden hunger - Greens, Vegetables and Fruits

**Unit IV: PHYTOCHEMICALS** (**6 Hours)**
Health promoting phytochemicals and antinutritional factors - Spices, and beverages - Lower plants as food sources - Mushrooms and their health benefits

**Unit V: WILD EDIBLES & FOOD SECURITY** (**6 Hours)**
Tribal knowledge of food plants - Seasonal foods and wild edible plants of *Kanikaran* and *Paliyan* tribes of Tamil Nadu - Sustainability, Food Security, and Health

**Text books**:

1. Begum, R.M. 2008. A Textbook of Foods, Nutrition & Dietetics, Sterling Publishers Pvt. Ltd.
2. Mudambi, S.R., Rajagopal, M.V. 2007. Fundamentals of foods, nutrition and diet therapy. New Age International.


**References**:

1. Gopalan, C., Sastri, B.V.R., Balasubramanian, S.C. 2014. Nutritive Value of Indian Foods, National Institute of Nutrition, Hyderabad
2. Dietary Guidelines for Indians – A Manual (English), National Institute of Nutrition, Hyderabad

**FOOD MICROBIOLOGY**
**(23UXRN31)**

| SEMESTER: III | NME | HOURS: 2 | CREDITS: 2 | TOTAL HOURS: 30 |
|---|---|---|---|---|

**Course outcomes:** Upon successful completion of this course, students should be able to:

**CO1:** Understand the fundamental principles of food microbiology and its importance in the food industry; Apply laboratory techniques for microbial analysis in food samples (K1).

**CO2:** Identify and characterize common food borne pathogens and their sources (K2).

**CO3:** Evaluate methods for food spoilage prevention and preservation (K2).

**CO4:** Describe the role of fermentation in food production and its health implications (K2).

**CO5:** Analyze emerging trends and ethical considerations in food microbiology; Apply regulatory guidelines and best practices for ensuring food safety and quality (K3).

**CO6:** Communicate effectively about food microbiology topics in both written and oral formats; Demonstrate critical thinking and problem-solving skills in food safety and quality assurance (K1-4).

**Unit 1: Introduction to Food Microbiology (6 hours)**

Overview of Food Microbiology; Historical Perspective; Microbial Classification and Taxonomy; Microbial Growth and Factors Affecting Growth; Laboratory Techniques in Food Microbiology

**Unit 2: Food borne Pathogens (6 hours)**

Common Food borne Pathogens (e.g., *Salmonella, Escherichia coli, Listeria, Campylobacter*); Sources of Food borne Pathogens; Detection and Control Strategies; Food borne Illness Outbreaks and Investigations; Food Safety Regulations

**Unit 3: Food Spoilage Microorganisms (6 hours)**

Types of Food Spoilage Microorganisms; Factors Influencing Food Spoilage; Spoilage Detection and Prevention; Food Preservation Methods; Food Packaging and Shelf-Life Extension

**Unit 4: Food Fermentation (6 hours)**

Fermentation in Food Production; Microorganisms Used in Fermentation; Fermented Food Products (e.g., yogurt, cheese, bread); Health Benefits of Fermented Foods; Quality Control in Fermentation

**Unit 5: Food Safety and Quality Assurance (6 hours)**

Food Safety Management Systems (HACCP); Good Manufacturing Practices (GMPs); Food Testing and Analysis; Risk Assessment and Management; Emerging Trends in Food Safety

**Reference Books:**


1. Food Microbiology: An Introduction by Thomas J. Montville and Karl R. Matthews, 2017
2. Foodborne Pathogens: Microbiology and Molecular Biology by Pina M. Fratamico, Arun K. Bhunia, and James L. Smith, 2005
3. Food Microbiology: Fundamentals and Frontiers by Michael P. Doyle, Robert L. Buchanan, and Vijay K. Juneja, 2019
4. Fermented Foods and Beverages of the World by Jyoti Prakash Tamang,2010
5. Food Safety Management: A Practical Guide for the Food Industry by Yasmine Motarjemi and HuubLelieveld, 2014

**HERBAL RESOURCES AND THEIR CONSERVATION**
**(23UXRN41)**

| SEMESTER: IV | NME | HOURS: 2 | CREDITS: 2 | TOTAL HOURS: 30 |
|---|---|---|---|---|

**Course outcomes:** At the end of the course the students will be able to

**CO1**: Understand the concepts in herbalism, medicinal plant trade and National policies (K2)

**CO2**: Recognize the threats and importance of conserving the medicinal plant resources (K2)

**CO3**: Explore the important medicinal plant resources of India, their scientific rationale and applications (K3)

**CO4**: Learn the good agricultural and collection practices of medicinal plants (K1)

**CO5**: Know the cultivation and post-harvest processing of selected medicinal plants cultivated Tamil Nadu (K2)

**CO1**: Understand the role of plant resources in global healthcare and its conservation (K1-K3)

**Unit I: SCENARIO OF HERBALISM** (**6 Hours)**

History of herbalism - Herbalism across the globe - Trade of herbals in ancient and contemporary India - Global herbal market and India's position

**Unit II: UNSUSTAINABLE USE OF HERBAL RESOURCES** (**6 Hours)**

Basics of endemism, IUCN categories of threat and CITES - Market demand - Negative impacts of collection from wild resources - Overexploited medicinal plants of India - *In situ* and *ex situ* conservation

**Unit III: HIGHLY USED HERBALS OF INDIA** (**6 Hours)**

Botany, identification, chemistry and applications of *Aswagandha, Seenthil, Nilavembu, Brahmi, Garcinia, Glycyrrhiza, Amla, Vilvam, Keelanelli*and*Satavari*

**Unit IV: CULTIVATION & POST-HARVEST PROCESSING** (**6 Hours)**

Good agricultural practices - Good collection practices - Storing medicinal plants – Post-harvest methods and value addition

**Unit V: CULTIVATION OF SELECTED MEDICINAL PLANTS** (**6 Hours)**

Good agricultural and collection practices for *Senkanthal, Senna, Vinca,Tulsi* and *Asogu*- Government schemes for cultivation of medicinal plants - Kitchen and home herbal gardens

**Text book**:

Wallis, T.E. 2018. Textbook of Pharmacognosy (Reprinted edition), CBS Publishers, New Delhi.

**References**:


1. Anonymous, Agro-techniques of selected medicinal plants Vols. I-III. 2014. National Medicinal Plants Board, Government of India.
2. Anonymous, WHO guidelines on good agricultural and collection practices (GACP) for medicinal plants. 2003. WHO, Geneva.
3. Ravikumar, K., Ved, D.K. 2000. Illustrated Field Guide to 100 Red Listed Medicinal Plants of Conservation Concern in southern India, FRLHT, Bangalore.
4. Ved, D.K., Goraya, G.S. 2007. Demand and Supply of Medicinal Plants in India. NMPB, New Delhi & FRLHT, Bangalore.

**SOCIETY, ECONOMY AND POLITICS IN CONTEMPORARY INDIA**
**(23UMXN41)**

| SEMESTER: IV | NME | HOURS: 2 | CREDITS: 2 | TOTAL HOURS: 30 |
|---|---|---|---|---|

**Course Outcome:**

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

CO1: Relate the concept of state and government (K1)
CO2: Understand and evaluate different types of societies in India (K2 & K5)
CO3: Identify and compare role of market in different types of economy (K3)
CO4: Examine and compare ideas of Ambedkar with other social, economic and political reformers (K4 & K5).
CO5: Analyse and formulate the casteless society in India.

**UNIT I: STATE AND GOVERNMENT (6 Hours)**

State and Government: Meaning and concepts – Features, characteristics and Nature of State and its dynamics in India

**UNIT II: DYNAMICS OF SOCIETY (6 Hours)**

Society: concept, meaning and basic characteristics of society – different types of societies – stratification of societies in India – Rural-Urban Structures and social Institutions.

**UNIT III: ECONOMY AND MARKET (6 Hours)**

Economy and Market: Meaning and concept, basic characteristics and types of economies – dynamics of economy and market in new economic policy era.

**UNIT IV: SOCIAL, ECONOMIC AND POLITICAL THINKERS IN INDIA (6 Hours)**

JyotiraoPhule, Periyar, Gandhi, Ambedkar and Amartya Sen on interaction of society, economy and politics and its dynamics.

**UNIT V: BUILDING CASTELESS SOCIETY (6 Hours)**

Annihilation of Caste: Meaning and concept - Meaning of sati, childhood marriage, endogamous and exogamy of marriage - Status of Dalit and women in Indian society – Dalit and women emancipation.

**References:**


1. Jodhka, S. S. (2002). Nation and village: Images of rural India in Gandhi, Nehru and Ambedkar. *Economic and political weekly*, 3343-3353.
2. Jodhka, S. S. (2010). Dalits in business: Self-employed scheduled castes in North-West India. *Economic and Political Weekly*, 41-48.
3. Jodhka, S. S. (2016). Ascriptive hierarchies: Caste and its reproduction in contemporary India. *Current Sociology*, *64*(2), 228-243.
4. Jodhka, S. S., &Fazal, T. (2021). Religion and Politics in South Asia. Sociological Bulletin, 70(4), 447–452. https://doi.org/10.1177/00380229211062752
5. Mitra, S. K. (1993). Caste, democracy and the politics of community formation in India. *The Sociological Review*, *41*(1_suppl), 49-71.

6. Mosse, D. (2020). The modernity of caste and the market economy. *Modern Asian Studies*, *54*(4), 1225-1271.
7. Nayyar, D. (1998). Economic development and political democracy: interaction of economics and politics in independent India. *Economic and Political Weekly*, 3121-3131.
8. Robinson, R. (2014). Planning and economic development: Ambedkar versus Gandhi. *Invoking Ambedkar: Contributions, Receptions, Legacies*, 59-71.
9. Singh, A. (2014). Gandhi and Ambedkar: Irreconcilable Differences? *International Journal of Hindu Studies*, *18*(3), 413-449.
10. Stiglitz, J. E. (2016). *The state, the market, and development* (No. 2016/1). WIDER Working Paper.
11. Vikas, R. M., Varman, R., & Belk, R. W. (2015). Status, caste, and market in a changing Indian village. *Journal of Consumer Research*, *42*(3), 472-498.

**INVERTEBRATA**
(Subject code: 23UZOC11)

**Semester: I Core: Theory 1 Credits: 5 Hours: 5**

**Course Outcomes**:

| At the end of the course the students will be able to | | |
|---|---|---|
| CO1 | Define and relate the classification and salient features of invertebrates. | **K1** |
| CO2 | Summarize the structure, function and life cycle of selected invertebrates by observing live and preserved specimens. | **K2** |
| CO3 | Demonstrate the behaviour and examine the adaptive significance of invertebrates. | **K3** |
| CO4 | Analyse the ecological role of representative organisms in each phyla. | **K4** |
| CO5 | Compare and establish phylogenetic relationships between the phyla covered. | **K5** |
| CO6 | Elaborate and Identify invertebrates with the use of literature and other resources. | **K6** |

**K1** - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6**– Create

**UNIT I: Classification of Animals and Protozoa (15 Hours)**

Animal kingdom – systems of classification, taxonomy and nomenclature. Levels of organization, Types of symmetry. General characters of Protista and classification (up to class) with examples.

Type study: *Paramecium caudatum.*

General topics: Protozoan parasites, the Life cycle of Plasmodium, Locomotion and Nutrition in Protozoa and the Economic importance of protozoa.

**UNIT II: Porifera and Coelenterata (15 Hours)**

General characters and classification (up to class) of Porifera and Coelenterata with examples and salient features of Ctenophora.

Type study: *Leucosolenia*and *Obelia geniculata.*

General topics: Canal system in sponges, Polymorphism in Coelenterata, Diversity of Corals, Structure of coral polyp and coral reefs, Affinities of Ctenophora.

**UNIT III: Platyhelminthes, Aschelminthes and Annelida (15 Hours)**

General characters and classification (up to class) of Platyhelminthes, Aschelminthes and Annelida with examples.

Type study: *Taenia solium*, and Earthworm.

General topics: Nematode parasites and their adaptations, Coelom and Coelomoducts, Metamerism in Annelida, Modes of life in polychaetes.

**UNIT IV: Arthropoda (15 Hours)**

General characters and classification (up to class) of Arthropoda with examples. Brief descriptions of *Limulus &Sacculina.*

Type study: Prawn (Digestive system, Nervous system, Excretory system)

General topics: Larval forms in Crustacea, Mouthparts of insects, Beneficial insects, Salient features of arachnids and Affinities of *Peripatus.*

**UNIT V: Mollusca and Echinodermata** **(15 Hours)**

General characters and classification (up to class) of Mollusca and Echinodermata with examples.

Type study: *Pila globosa*, *Asterias rubens* - external features, digestive system, circulatory system, respiratory system and reproductive system.

General topics: Torsion and de-torsion in gastropods, Cephalopods as an advanced mollusc, Economically important molluscs, Water vascular system, Larval forms and affinities of echinoderms.

**Textbooks:**


1. Arumugam N et al., (2018). Invertebrata Volume-1, Saras Publications.
2. Jordan EL, Verma PS, (2012). Invertebrate Zoology, S Chand & Co Ltd.
3. Kotpal RL, (2000). Modern textbook of Zoology: Invertebrates. Rastogi Company.
4. Ekambaranatha Ayyar M, Ananthakrishnan TN, (2000). Manual of Zoology: Invertebrata. S Viswanathan Pvt Ltd.


**Reference Books:**


1. Barnes Robert D, (2004). Invertebrate zoology. Cengage Learning.
2. Rupert et al., (2006). Invertebrate zoology. Thomson Brooks Publishers.
3. Anderson DT, (2001). Invertebrate zoology. Oxford University Press.
4. Barrington EJW, (2000). Invertebrate structure and function. English Language Book Society.
5. Marshall AJ, Williams WD, (2000). Textbook of zoology invertebrates. English Language Book Society.
6. Jan A Pechenik, (2000). Biology of the invertebrates. Tata Mc-Graw Hill Publishing Company.
7. Borradaile LA, Potts FA, (2000). Invertebrata. Crystel Achagam.
8. Hyman LH, (2000). Invertebrates Volume I – VI. Mc-Graw Hill Book Company.


**E-resources**

1. https://www.mgccc.edu/learning_lab/science/PROTOZOANS.pdf
2. http://www.angelo.edu/~crussell/Lectures/Ppt/S05/web/chapt11-protozoa.pdf
3. http://nsdl.niscair.res.in/jspui/bitstream/123456789/817/1/Platyhelminthes%20%20-%20Formatted.pdf
4. http://www.bu.edu/gk12/eric/Annelida.pdf
5. http://www.mhhe.com/biosci/genbio/raven6b/graphics/raven06b/other/raven06_46.pdf
6. http://nsdl.niscair.res.in/jspui/bitstream/123456789/693/1/PHYLUM%20MOLLUSCA%20-%20Formatted.pdf
7. https://arxiv.org/abs/1606.01631
8. http://web2.uconn.edu/cyberinfra/module4/Taxonomy.pdf
9. https://www.britannica.com/animal/sponge-animal
10. http://biologyboom.com/phylum-porifera/
11. https://lter.limnology.wisc.edu/sites/default/files/Porifera%20Chapter%204_Frost.pdf
12. http://www.biologydiscussion.com/invertebrate-zoology/phylum-ctenophora/phylum-ctenophora-features-characters-and-other-details/28786

| Mapping with programme outcomes | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **COs** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** |
| **CO1** | M | S | M | M | S | S | L | S |
| **CO2** | S | S | M | M | S | M | S | S |
| **CO3** | S | S | M | S | S | M | M | S |
| **CO4** | S | S | S | L | S | S | M | S |
| **CO5** | S | S | S | L | M | S | M | S |
| **CO6** | S | S | L | L | M | L | S | S |

* S- Strong, M- Medium, L- Low

## INVERTEBRATA - PRACTICALS

(Subject code: 23UZOC12)

**Semester: I Core: Practical 1 Credit: 3 Hours: 3**

**Course Objectives:**

- Students will learn about the importance of systematic, taxonomy, structural organization of the animals and will appreciate the diversity of Invertebrates.
- They will understand the evolutionary history and relationships of different Invertebrates through functional and structural affinities.
- They will be able to critically analysethe organization, complexity and characteristic features of Invertebrates along with their significance and interactions with the environment.

1. Virtual dissection:
   Grasshopper, Earthworm and Starfish
2. Mounting -Earthworm body setae and pineal setae
3. Cockroach-Mouthparts, digestive system, reproductive system, nervous system
4. Mounting of marine prawn appendages -Cephalothorax and abdominal Appendages
5. Separation of spicules from drifted sponges
6. Collection, preservation and submission of invertebrates (dead specimens only).
7. Survey of pond water for free living organisms.
8. Field Visit: Terrestrial and coastal ecosystem (compulsory)
9. Mini project:
   - An animal album with photographs, paper cuttings with appropriate write-up
   - Photographs, paper cuttings of endangered and threatened invertebrates
10. Study of preserved specimens :*Hydra, Aurelia*, Sea anemone, *Sepia*, Octopus, Star fish, Sea urchin, Sea cucumber, Sea lily, Liver fluke, Tape worm, *Ascaris*, *Nereis*, Earthworm, Leech, Prawn, Scorpion, Millipede, Crab, Scorpion, *Limulus*, *Peripatus, Pila, Lamellidens*
11. Study of slide mounted specimens :*Paramecium, Euglena, Leucosolenia,* Redia larva, Cercaria larva, Trochophore larva, Nauplius larva, Zoea larva, Mysis larva, Megalopa larva, Bipinnaria larva and Planaria

**CHEMISTRY FOR BIOLOGICAL SCIENCES I**
**(SUB CODE.23UCHE11)**

| SEMESTER I | EC- T1 | CREDITS – 2 | H/W :4 |
|---|---|---|---|

**Course Outcomes**

**On completion of the course the students should be able to**

- State the theories of chemical bonding, nuclear reactions and its applications. (K1)
- Evaluate the efficiencies and uses of various fuels and fertilizers. (K3)
- Explain the type of hybridization, electronic effect and mechanism involved in the organic reactions.(K2)
- Demonstrate the structure and uses of antibiotics, anaesthetics, antipyretics and artificial sugars. (K4)
- Analyse various methods to identify an appropriate method for the separation of chemical components. (K5)
- Evaluate the efficiency of different fuels. (K3)

**UNIT I Chemical Bonding** **(12 hours)**

Valency and valence electrons, electronic theory of valency, Electrovalency-conditions favouring electrovalency-illustrations, electrovalent compounds and their properties, Covalency-conditions favouring covalency-illustration, covalent compounds and their properties, coordinate covalency-conditions favouring it-illustration. Fajan's Rule.

Molecular Orbital Theory-bonding, antibonding and non-bonding orbitals. M. O diagrams for Hydrogen, Helium, Nitrogen; discussion of bond order and magnetic properties.

**Unit II Industrial Chemistry** **(12 hours)**

Fuels: Fuel gases: Natural gas, water gas, semi water gas, carbureted water gas, producer gas, CNG, LPG and oil gas (manufacturing details not required).
Silicones: Synthesis, properties and uses of silicones.
Fertilizers: Urea, ammonium sulphate, potassium nitrate NPK fertilizer, superphosphate, triple superphosphate.

**UNIT III Fundamental Concepts in Organic Chemistry** **(12 hours)**

Hybridization: Orbital overlap hybridization and geometry of $CH_4$, $C_2H_4$, $C_2H_2$ and $C_6H_6$.
Polar effects: Inductive effect, elecromeric and Mesomeric effect.
Chromatography: principle and application of column, paper and thin layer chromatography

**UNIT IV Drugs and Speciality Chemicals** **(12 hours)**

Definition, structure and uses: Antibiotics viz., Penicillin, Chloramphenicol and Streptomycin; Anaesthetics viz., Chloroform and ether; Antipyretics viz., aspirin, paracetamol and ibuprofen; Artificial Sweeteners viz., saccharin, Aspartame and cyclamate; Organic Halogen compounds viz., Freon, Teflon.

**UNIT V: Analytical Chemistry-I** **(12 hours)**

Principles of volumetric analysis. Methods of expressing concentration of solution. Normality, Molarity, Molality, Mole fraction, Equivalent weights of acids bases, oxidizing agents and reducing agents. Primary standard, secondary standard, preparation of standard solution. Principles of Acid-base tratrations-theory of indicators, permanganimetry,

Dichrometry, Iodometry, Indimetry.

**Text books**


1. V.Veeraiyan, Textbook of Ancillary Chemistry; High mountpublishing house, Chennai, first edition,2009.
2. S.Vaithyanathan, Text book of Ancillary Chemistry; PriyaPublications, Karur,2006.
3. ArunBahl, B.S.Bahl, Advanced Organic Chemistry; S.Chandand Company, New Delhi, twenty third edition,2012.
4. P.L.Soni, H.M.Chawla, Text Book of Inorganic Chemistry;Sultan Chand & sons, New Delhi, twenty ninth edition, 2007.


**Reference Books**


1. P.L.Soni, Mohan Katyal, Text book of Inorganic chemistry; Sultan Chand and Company, New Delhi, twentieth edition, 2007.
2. B.K,Sharma, Industrial Chemistry; GOEL publishing house,Meerut, sixteenth edition, 2014.
3. Jayashree gosh, Fundamental Concepts of Applied Chemistry; Sultan & Chand, Edition 2006.

**CHEMISTRY PRACTICAL FOR BIOLOGICAL SCIENCES - I**
**(SUB CODE.23UCHE12)**

**SEMESTER I** **EC- P1** **CREDITS – 2** **H/W=2**

**Course Outcomes:**

**On completion of the course the students should be able to**

- gain an understanding of the use of standard flask and volumetric pipettes, burette (K2)
- design, carry out, record and interpret the results of volumetric titration. (K3)
- apply their skill in the analysis of water/hardness. (K4)
- analyze the chemical constituents in allied chemical products (K5)

**VOLUMETRIC ANALYSIS**

1. Estimation of sodium hydroxide using standard sodiumcarbonate.
2. Estimation of hydrochloric acid using standard oxalic acid.
3. Estimation of ferrous sulphate using standard Mohr's salt.
4. Estimation of oxalic acid using standard ferrous sulphate.
5. Estimation of potassium permanganate using standardsodium hydroxide.
6. Estimation of magnesium using EDTA.
7. Estimation of ferrous ion using diphenyl amine as indicator.

**Reference Book**

1. V.Venkateswaran, R.Veerasamy, A.R.Kulandaivelu, Basic Principlesof Practical Chemistry; Sultan Chand & sons, Second edition, 1997.

## HUMAN VECTORS

(Subject code: 23UZON11)

**Semester: I SEC:1 (Optional) Credit: 2 Hours:2**

**Course Outcomes**:

| At the end of the course the students will be able to | | |
|---|---|---|
| CO1 | Label the taxonomy, classification and life of insects in the animal kingdom. | **K1** |
| CO2 | Demonstrate mechanisms of transmission of diseases from pets to humans. | **K2** |
| CO3 | Organizing insects that act as vectors causing diseases in animals and human. | **K3** |
| CO4 | Categorize about biology, nature of damage of the harmful vectors. | **K4** |
| CO5 | Determining and emphasizing the importance of disease causing insects and their management measures. | **K5** |
| CO6 | Elaborate and identify and name insects with the use of literature and other resources. | **K6** |

**K1** - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6**– Create

**Unit I: Salient features of human Vectors ( Hours: 6)**

General salient features of insects, rodents, snails, birds, dogs, bats and other carnivorous mammal vectors of human beings; Host- vector relationship, Vectorial capacity; Adaptations as vectors.

**Unit II: Insect Vectors-I (Hours: 6 )**

General life cycle, mode of disease transmission, prevention and control of mosquitoes.

**Unit III: Insect Vectors-II (Hours: 6)**

General life cycle, mode of disease transmission, prevention and control of houseflies, cockroaches, head louse and Triatomine bugs.

**Unit IV: Other invertebrate vectors (Hours: 6)**

General life cycle, mode of disease transmission, prevention and control of helminths, fleas, ticks, mites and snails.

**Unit V: Vertebrate vectors (Hours: 6)**

General life cycle, mode of disease transmission, prevention and control of birds, dogs and mammals.

**Textbook:**

Mathews, G. 2011.Integrated Vector Management: Controlling Vectors of Malaria and Other Insect Vector Borne Diseases, Wiley-Blackwell

**Reference books:**


1. Imms, A.D. 1977. A General Text Book of Entomology. Chapman & Hall, UK
2. Chapman, R.F. 1998. The Insects: Structure and Function. IV Edition, Cambridge University Press, UK.
3. Pedigo L.P. 2002. Entomology and Pest Management, Prentice Hall Publication


**E-resource**

1. https://www.rentokil.com/vector-control/disease-vectors/
2. http://www.who.int/mediacentre/factsheets/fs387/en/
3. http://apps.who.int/iris/bitstream/10665/42498/1/WHO_CDS_CPE_SMT_2001.14.pdf
4. http://www.who.int/water_sanitation_health/resources/vector337to356.pdf
5. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3668993/
6. Online free book: Vector-Borne Diseases- https://www.ncbi.nlm.nih.gov/books/NBK52941/

| Mapping with programme outcomes | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **COs** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** |
| **CO1** | M | S | S | S | S | S | S | S |
| **CO2** | S | S | S | M | S | S | M | S |
| **CO3** | S | S | S | M | L | S | S | M |
| **CO4** | S | S | S | S | L | S | S | S |
| **CO5** | S | S | S | S | L | S | S | M |
| **CO6** | S | S | S | S | L | M | S | S |

* S- Strong, M- Medium, L- Low

**PUBLIC HEALTH AND HYGIENE**

(Subject code: 23UZON11)

**Semester: I SEC: 1 (Optional) Credits: 2 Hours: 2**

**Course Outcomes**:

| At the end of the course the students will be able to | | |
|---|---|---|
| CO1 | To remember the spectrum of health and health awareness. | **K1** |
| CO2 | To understand the concepts of health and a balanced diet | **K2** |
| CO3 | To acquire knowledge on environment and health | **K3** |
| CO4 | To analyse mental health and self control | **K4** |
| CO5 | To compare health education and health situation in India | **K5** |
| CO6 | Creates awareness of the value ofhuman health for successful existence. | **K6** |

**K1** - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6**– Create

**UNIT I: Health Concepts (6 Hours)**

Determinants of health; indicators of health; personal hygiene; public and community health

**UNIT II: Nutrients (6 Hours)**

Macronutrients – proteins, carbohydrates and lipids; micronutrients and trace elements; vitamins; Energy requirements; balanced diet; malnutrition in children and adult.

**UNIT III: Nutritional requirements (6 Hours)**

Nutitiona1 requirements of growing children, adults, pregnant women, lactating women and convalescents.

**UNIT IV: Diseases and Treatment (6 Hours)**

Communicable diseases - viral and bacterial diseases (Polio, Chicken box, Dengue, Malaria); Non communicable diseases - diabetics, heart diseases and kidney problems.

**UNIT V: Environment and Health (6 Hours)**

Causative agent, symptoms, prevention and management of waterborne (Typhoid and Cholera) and airborne diseases (Tuberculosis).

**Textbooks:**


1. Sorna Raj, R &Kumerasen V. 2010. Public health and hygiene, Saras Publications.
2. Ambika Shanmugam 1999. Fundamentals of Biochemistry for Medical Students, Published by the Author, Chennai.
3. Shubhangini A. Joshi 1992. Nutrition and dietetics - Tata McGraw Hill, Publishing company Ltd, New Delhi.

**Reference Books:**


1. Srilakshmi, S. 1993. Dietetics - New Age International (P) Ltd. Publishers, New Delhi.
2. Ananthanarayanan, R. and JayaramPaniker, C.K. 2000. Text Book of Microbiology, Orient Longman, Chennai.


**E-Resources:**

1. www.traditionalmedicine.nic.in
2. www.moef.nic.in
3. www.iucn.org/india
4. www.who.int
5. www.wwfindia.org

| Mapping with programme outcomes | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **COs** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** |
| **CO1** | S | L | L | S | S | S | S | S |
| **CO2** | S | L | S | L | S | S | M | S |
| **CO3** | S | L | M | M | M | M | S | M |
| **CO4** | S | L | L | S | M | S | S | S |
| **CO5** | S | M | S | L | M | S | S | M |
| **CO6** | S | S | S | S | L | M | S | S |

* S- Strong, M- Medium, L- Low

## CHORDATA

(Subject code: 23UZOC21)

**Semester: II** **Core: Theory 2** **Credits: 5** **Hours: 5**

**Course Outcomes:**

| At the end of the course, the students will be able to | | |
|---|---|---|
| CO1 | Gain knowledge of the general features and classification of living chordates. | **K1** |
| CO2 | Understand the functioning of various systems. | **K2** |
| CO3 | Demonstrate the distinguishing features of chordates. | **K3** |
| CO4 | Categorize animals based on their similarities and differences. | **K4** |
| CO5 | Evaluate the adaptive features and mechanisms. | **K5** |
| CO6 | Organize evolutionary relationships of chordates. | **K6** |

**K1** - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6**– Create

**UNIT I:Prochordates and Pisces** **(15 Hours)**

General characters and classification of Chordata (up to class) and Pisces (up to order) with examples.

Type study: Amphioxus*, Scoliodon*(digestive, circulatory, sensory, reproductive systems).

General topics: Affinities of Hemichordates, Retrogressive metamorphosis in Ascidia, Key difference between Prochordates and Vertebrates**,** Salient features of Cyclostomes, Holocephali and Dipnoi, Accessory respiratory organs in fishes, Types of fins & function, Migration of fishes.

**UNIT II: Amphibia** **(15 Hours)**

General characteristics and classification of Amphibia (up to order) with examples.

Type study: Frog (respiratory, digestive, reproductive system).

General topics: Metamorphosis of amphibians, Limbless amphibians, Parental care in amphibians and Paedomorphosis.

**UNIT III: Reptilia** **(15 Hours)**

General characteristics & classification of Reptilia (up to order) with examples.

Type study: *Calotes* (respiratory, digestive, and reproductive system).

General topics: Identification of venomous and non-venomous snakes, Poison apparatus and types of venom, Snakebite& first aid, Skull of reptiles and Salient features of Chelonia and Crocodilia.

**UNIT IV: Aves** **(15 Hours)**

General characteristics and classification of Aves (up to order) with examples.

Type study: *Columba livia*(respiratory, circulatory, and digestive systems).

General topics: Flightless birds, Flight adaptations in birds, Mechanism of flight, Feet and beak modifications, and Migration in birds.

**UNIT V: Mammalia** **(15 Hours)**

General characteristics and Classification of Mammals (up to order) with examples.

Type study: *Oryctolagus cuniculus* (respiratory, circulatory, and digestive systems).

General topics: Affinities of monotremes, Diversity of marsupials, Aquatic mammals and adaptation, Dentition in mammals.

**Text books**


1. Thangamani TK et al., (2018). A textbook of chordates. Saras Publications.
2. Jordan EL, Verma PS, (2010). Chordate Zoology. S Chand & Company.
3. Kotpal RL, (2000). Vertebrates. Rastogi Publications.
4. Ekambaranatha Ayyar M, Ananthakrishnan TN, (2000). Manual of zoology, Volume II, Chordata


**Reference books**


1. Young JZ, (2011). The life of vertebrates. Oxford University Press.
2. DeBeer Gavin, (2000). Vertebrate zoology. Sidgwick& Jackson Ltd.
3. Robert T Orr, (2000). Vertebrate biology. WB Saunders Company.
4. Barrington EJW, (2000). Biology of hemichordata and protochordata. Oliver & Boyd.
5. Pough Harvey F, Christine M. Janis and John B. Heiser (2002). Vertebrate Life, Pearson Education Inc. New Delhi.


**E-Resources**

1. https://www.earthlife.net/inverts/hemichordata.html
2. http://www.askiitians.com/biology/animal-kingdom/phylum-chordata-and-hemichordata.html#difference-between-lower-and-higher-chordates
3. http://www.biozoomer.com/2011/11/pisces-classification-super-class.html
4. https://www.shapeoflife.org/resource/about-chordates
5. https://www.oercommons.org/courseware/lesson/15083/overview?section=9

| Mapping with programme outcomes | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **COs** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** |
| **CO1** | M | S | M | M | S | S | L | S |
| **CO2** | S | S | M | M | S | M | S | S |
| **CO3** | S | S | M | S | S | M | M | S |
| **CO4** | S | S | S | L | S | S | M | S |
| **CO5** | S | S | S | L | M | S | M | S |
| **CO6** | S | S | L | L | M | L | S | S |

* S- Strong, M- Medium, L- Low

## CHORDATA - PRACTICAL

(Subject Code: 23UZOC22)

**Semester: II** **Core: Practical 2** **Credits: 3** **Hours: 3**

**Course outcomes:**

- The course teaches the students about the diversity of vertebrate members of the animal kingdom.
- This course brings into perspective the regular yet largely ignored observances about the members of the animal kingdom and helps students to identify and group various animals.
- The course leads the students to understand evolutionary relations between different groups in the animal kingdom, their global distribution as well as their conservation status.

1. Mounting of Placoid Scales - Preserved specimens (Shark skin)
2. Types of scales in fishes - Preserved specimens
3. Diversity of Feathers- Preserved specimens
4. Digestive system of a fish - (market specimens)
5. Air bags in fishes (market specimens)
6. Reproductive systems of a fish (market specimens)
7. Simple phylogenetic grouping of Animals
8. Virtual dissection -Frog –https://www.emindweb.com/demo/frog/
9. Activity card preparation – observation of birds and their behaviour
10. Key for identification of venomous and non-venomous snakes
11. Zoological names for common animals
12. Field Visit: Terrestrial ecosystem and a Sea shore (compulsory).
13. Submission: Work sheets, Map of Hot spots of the world, Pictures of endangered species.
14. Project related to Biodiversity and submission of report.
15. **Spotters (restricted to 30specimens only)**: Prochordates: Amphioxus, Balanoglossus, Ascidian; Pisces: Cyclostomata, Petromyzon, Myxine, Scoliodon, Astrape, Anguilla, Echenis, Hippocampus, Sardine, Channa, Catfish, Diodon, Tetrodon; Amphibia: Ichthyophis, Salamandra, Ambystoma, Axolotyl larva, Rachophorus, Bufo; Reptilia: Hemidactylus, Draco, Chameleon, Cobra, Viper, Enhyrina, Echis, Dendrophis, Typhlops, Chelon-sea turtle, Tertudo-sea tortoise, Crocodile; Aves: Blue jay, Netolopus, Indian spoonbill, great Indian hornbill, pelicanus, White breasted kingfisher, Braminikite, Parakeet, Patridge, Black drango, Quail; Mammals: Hedge hog, Loris, Mangoose, Pangolin, Chaetopterus, Porcupine; Osteology of Rabbit- skull dorsal view, Lower Jaw, Lumbar vertebrae, Pectoral girdle, Pelvic girdle, Fore and Hind limb.

**Allied Chemistry II**

**(Subject code: 23UCHE21)**

| SEMESTER II | EC- T1 | CREDITS – 3 | H/W=4 |
|---|---|---|---|

**On completion of the course the students should be able to**

- Explain fundamental thermodynamic properties (K1)
- List and explain several technological applications of colloids (K2)
- Summarize the roles carbohydrates, alkaloids and terpenoids play in biological systems.(K3)
- Figure out how many stereoisomers a compound has, and synthesis of a few heterocyclic molecules.(K4)
- Prepare and standard solutions and standardize an unknown solution.(K5)

**Unit I Thermodynamics (12 hrs)**

Introduction - Basic terminology and functional concepts- System, boundary and surrounding- Types of systems: open, closed and isolated- Properties of a system: extensive and intensive - State of a system and state variables (or state functions)-Thermodynamic equilibrium - Process and types: Isothermal, adiabatic, isochoric, isobaric, cyclic, reversible, and irreversible- comparison between isothermal and adiabatic processes, reversible and irreversible processes - Internal energy as a state function- components of internal energy- Work: Thermodynamic concept-types of work - Heat : Thermodynamic concept- Heat and work as path functions - First law of thermodynamics- Statement of the law of conservation of energy- Mathematical expression of the law- Application of the law- Heat capacity, specific heat capacity and molar heat capacity of asystem- Relation between molar hear capacities of gases- Enthalpy and enthalpy change- Enthalpy as a state function- Relation between ΔH and ΔE- Enthalpies of reaction, formation and combustion-Definition and illustration- standard state- Calculation of enthalpy change using Hess law- Bond enthalpies and bond dissociation enthalpies-Definition and illustration using $CH_4$ as example (Numerical problems not expected)- Spontaneous (natural) process- Entropy-it's meaning of disorder- Gibb's free energy-its meaning as available energy- Criteria for spontaneity

**Self study:** ideal gas, ideal gas equation, homogeneous reactions and heterogeneous reactions, heat.

**UNIT II Surface Chemistry and Colloidal Chemistry (12 hrs)**

Adsorption chemistry-introduction-definition-distinction from adsorption- Adsorption and adsorbate-definition and explanation- Types of colloidal systems- Classification of colloids-Lyophilic and lyophobic sols-a comparison- Stability of colloids-origin of charge-electrical double layer-salvation- Electrical properties-electrophoresis and electro-osmosis-Gels- gelation-classificatio-properties of gels-hydration, swelling or inhibition, syneresis and thixotropy- Emulsions-types of emulsion-identification of emulsion-dilution test, dye test, spreading test, viscosity and electrical conductivity-de-emulsification- Application of colloid in food, medicine, industry, purification of water, artificial rain, blue colour of the sky and cleaning action of soap.

**Self study:** Adsorbent, adsorbate, molecular interactions.

**UNIT III Carbohydrates, Alkaloids and Terpenoids (12 hrs)**

Introduction- Monosaccharide- Reaction of glucose- Open chain structure and ring structure of glucose (elucidation not expected)- Epimers, mutarotation- Interconversion of glucose into fructose and vice versa- Disaccharides- Reactions and structure of sucrose (elucidation nor expected)- Structure of maltose and lactose (elucidation not expcted)- Polysaccharide- Starch- amylase and amyl pectin-type of glycosidic linkage- Reaction of starch-action of heat-, hydrolysis and with iodine- Alkaloids- Definition, classification, (based on structure) occurrence and extraction- General methods of identification-functional nature of oxygen-functional nature of nitrogen-unsaturation-exhaustive methylation-Structure of conine- Terpenoids- Introduction, classification of terpenoids-Isoprene rule-Structure of citral (synthesis not included)

**Self study:** Examples for food contains carbohydrates

**UNIT IV Stereoisomerism and Heterocyclic Compounds (12 hrs)**

Optical isomerism- Plane polarized light - Optical activity - Asymmetric carbon-chirality - Elements of symmetry-plane of symmetry- axis of symmetry-centre of symmetry-dissymmetric- Van't Hoff-le Bel theory- Optical isomerism of tartaric acid- Racemization - Resolution of racemic-mixture-biochemical method, chemical method and chromatographic method- Geometrical isomerism- Cause for geometrical isomerism- Illustration of compounds containing C-C double bond - Heterocyclic compounds- Pyrrole- Introduction-aromatic character- Basic and acidic character of pyrrole- Pyridine- Electronic interpretation of electron-rich centers- Reaction of pyridine- Quinoline- Skaraup synthesis - Reactions of quinoline

**Self study:** Isomers, cyclic compounds, practice to draw the structure of simple molecules like $H_2O$, $NH_3$ etc.

**UNIT V Analytical Chemistry-II (12 hrs)**

Types of reactions relevant to qualitative analysis - Displacement reaction – Decomposition - Double decomposition- Hydrolysis- redox reaction- Complex formation-Interfering anions and their elimination- Group reagents and analytical group classification-Explanation and application of the following principles in qualitatiive analysis- Solubility and solubility product- Common ion effect- pH- Buffer.

**Self study:** Anions , cations, saturated solution, unsaturated solution, acids and bases.

**Note:** Course materials will be supplied to the students.

**ALLIED CHEMISTRY PRACTICAL - II**

**Inorganic qualitative analysis**

**(Subject code: 23UCHE22)**

| SEMESTER II | EC- P2 | CREDITS – 2 | H/W=2 |
|---|---|---|---|

**On completion of the course the students should be able to**

**CO 1:** Explain and demonstrate the techniques of elimination of interfering radicals (K2)

**CO 2:** Apply the physical and chemical properties of various ions in the identification if unknown samples (K3)

**CO 3:** Categorize the metal ions into different groups. (K3)

**CO 4:** Identify the presence of inorganic salts in biological samples. . (K4)

**CO 5:**Separate ions using common ion effect and solubility product (K5)

**CO 6:** Analyze samples using microscale techniques (K4)

Qualitative analysis of a simple salt containing one anion and one cation

**Anions** : Carbonate, Borate, Fluoride, Oxalate and Phosphate

**Cations** : Lead, Bismuth, Copper, Cadmium, Cobalt, Nickel, Manganese, Zinc, Barium, Strontium and Ammonium

**Note:** Laboratory manual will be supplied.

## ORNAMENTAL FISH FARMING

(Subject code: 23UZON21)

**Semester:II** **SEC: 2** **Credits: 2** **Hours :2**

**Course Outcomes:**

| At the end of the course, the students will be able to | | |
|---|---|---|
| CO1 | Describe aquarium design and the biology of common ornamental fishes. | **K1** |
| CO2 | Understand the basic knowledge of ornamental fishes | **K2** |
| CO3 | Implement the entire breeding techniques in fishes | **K3** |
| CO4 | Compare the various diseases and control measures | **K4** |
| CO5 | Evaluate the physio chemical parameters of the home aquarium | **K5** |
| CO6 | To propose best management practices for home aquarium | **K6** |

**K1** - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6**– Create

**Unit 1: Management of Aquarium** **(6 hours)**

Design and construction of glass aquarium and setting up of aquarium; under gravel filter, pebbles, plants, drift wood, ornamental objects and selection of fishes, accessories (aerators, light, filters) and maintenance of water quality.

**Unit 2: Identification and biology of common ornamental fishes** **(6 hours)**

Identification, distribution and biology of common ornamental fishes - fighting fish(Betta *splendens*),Goldfish(*Carassius auratus*), Koicarp (*Cyprinus carpio*), Gourami(*Colisa lalia*,), Angel fish(*Pterophyllumscalare*) and Red-tailed black shark(*Epalzeorhynchos bicolour*).

**Unit 3: Breeding of common ornamental fishes** **(6 hours)**

Breeding technologies of common ornamental fishes - fighting fish, Goldfish, koicarp, Gourami, Angel fish and Red tailed black shark.

**Unit4: Food and Feeding** **(6 hours)**

Culture of live feed organisms (Zooplankton, Rotifers, Copepods, Cladocerans, Brine shrimp), Artificial feeds. Methods of fish feeding and balanced diets for aquarium fishes.

**Unit 5: Disease Management and Economics** **(6 hours)**

Identification of common parasites (argulus, lernaea, nematodes) and bacterial, viral, and fungal diseases of ornamental fishes and their control and prophylaxis. Economics of ornamental fish culture.

**Text Book:**

1. Jameson, J.D. and Santhanam. R. 1996, Manual of ornamental fishes and farming, Technologies Peejay, Thoothukkudi.

2.Santhanam R, Sukumaran N (2000). Manual of freshwater aquaculture. SugainnaPathipagam.

3. Shanmugam K (2000). Fishery biology and aquaculture. Leo Marca Ashram.

4. Srivastava CBL, (2000). Textbook of fishery science and Indian fisheries. KitabMahal.

5. Arumugam, N. 2010. Home Aquarium, Saras Publication.

**Reference Books:**

1. Rath, R.K. 2000. Freshwater Aquaculture. Scientific Publishers (India). PO Box: 91, Jodhpur.
2. Mohan Kumar, C. 2008. Handbook on ornamental fish diseases, MPEDA, India.
3. Jhingran VG (2000). Fish and fisheries of India. Hindustan Publishers.
4. Peter B Moyle, Joseph J Cech, (2004). Fishes an introduction to ichthyology, 5th edition, PHI Learning Pvt. Ltd.
5.Baeumont Hoare K, (2000). Biotechnology and genetics in fisheries and aquaculture. Blackwell Publishing.
6. Landau Matthew, (2000). Introduction to aquaculture. John Wiley & Sons Inc.

| Mapping with programme outcomes | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **COs** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** |
| **CO1** | S | S | S | S | S | S | S | S |
| **CO2** | S | S | M | L | S | S | M | S |
| **CO3** | S | M | M | L | S | M | S | M |
| **CO4** | S | S | S | L | S | S | S | S |
| **CO5** | S | S | M | L | S | S | S | M |
| **CO6** | S | S | L | L | S | M | S | S |

* S- Strong, M- Medium, L- Low

## CELL BIOLOGY

(Subject code: 23UZOC31)

**Semester: III Core: Theory 3 Credits: 5 Hours: 5**

**Course Outcomes:**

| At the end of the course the students will be able to | | |
|---|---|---|
| CO1 | Describing the basic physical and chemical organization of living organism, and use of microscopy | **K1** |
| CO2 | Understanding the structural organization and function of cell organelles | **K2** |
| CO3 | Experimenting how cells grow, divide, and die and how these important processes are regulated | **K3** |
| CO4 | Distinguishing the molecular structure, function and interaction of genes | **K4** |
| CO5 | Predicting gene regulation in prokaryotes and eukaryotes | **K5** |
| CO6 | Prepare histological specimens | **K6** |

**K1** - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6**– Create

**Unit I: Introductory cytology (15 Hours)**

Cell theory, Ultra structure of prokaryotic and eukaryotic cells; Principle, components, resolving power and applications of Compound, Phase contrast, Fluorescent, Confocal and Electron Microscopes (SEM and TEM); Histological techniques - Tissue fixation, sectioning and staining.

**Unit II: Cell organelles (15 Hours)**

Ultrastructure and functions of Plasma membrane, Specializations of plasma membrane, Cell junctions; Ultra structure and functions of membranous organelles (Endoplasmic reticulum, Golgi body, Mitochondria, Peroxisomes, Lysosomes, Transport Vesicles), Ultra structure and functions of non-membranous organelles (Ribosomes, Microtubules, Actin Filaments, Intermediate Filaments, Centrosomes).

**Unit III: Nucleus and cell division (15 Hours)**

Ultra structure of nucleus - Nuclear envelope, Chromatin, Nucleosome, Nucleolus, Nuclear matrix; Cell division –cell cycle, phases of mitosis and meiosis, its regulation; Chromosomes – structure and types, Karyotype, Giant chromosome, Apoptosis, Cell differentiation, Cancer – properties, origin, types and causes.

**Unit IV: Nucleic acids, DNA repair and Mutagenesis (15 Hours)**

Salient features of DNA and RNA; Watson and Crick model of DNA, DNA forms; Types and role of RNA, the structure of tRNA; Mechanism of DNA replication; DNA repair mechanisms - Pyrimidine dimerization and mismatch repair; Modern concept of prokaryotic and eukaryotic genes; Mutation – types; mutagens, molecular basis of mutation.

**Unit V: Gene expression and regulation (15 Hours)**

Gene expression **-** transcription, short outline of post-transcriptional modifications, RNA transport; Properties of genetic code; Polysomes, Protein synthesis, protein folding**;** Gene regulation -Transcription regulation in prokaryotes: lac operon and trp operon; Transcription regulation in eukaryotes: Activators, repressors, enhancers, silencer elements; Gene silencing and Genomic imprinting.

**Textbooks:**


1. Arumugam N, 2010. Cell Biology & Molecular Biology, Saras Publications, Nagercoil.
2. Rastogi S C 2011. Cell and Molecular Biology, New Age International Publishers.
3. Jahir Hussain G 2011. Elements of Cell and Molecular Biology, Anmol Publications Pvt Ltd.
4. Powar, C.B. 1977. Cell Biology, Himalayas Publishing House, Bombay.
5. Gupta, P.K. 1999. Cell and Molecular Biology, Rastogi Publications, Meerut, India.
6. Verma, P.S. and Agarwal, V.K. 1998. Concepts of Molecular Biology, S. Chand & Company Ltd., New Delhi.


**Reference books:**


1. De Robertis, E.D.P. and De Robertis, E.M.F. 2006. Cell and Molecular Biology. VIII Edition. Lippincott Williams and Wilkins, Philadelphia.
2. Karp, Gerald 2012. Cell and molecular Biology, John Wiley and sons, New York
3. Prakash S. Lohar 2007. Cell and Molecular Biology, M.J.P. Publications, Chennai.
4. Sivarama Sastri, K.G. and Padbanaban and Subramanian 1994. Textbook of Molecular Biology. Mac Millan India Ltd. New Delhi.
5. Ajoy Paul. 2011. Text book of cell and molecular Biology, Third Edition, Books of Allied (P) Ltd., Chintamani Das Lane, Kolkatta.


**E-resources :**

1. https://www.hccfl.edu/media/572066/microscopy.pdf
2. http://www.science-info.net/docs/AO-Spenser/GreysHandbook.pdf
3. http://www.microbiologynotes.com/differences-between-prokaryotic-and-eukaryotic-cells/
4. https://www.kenhub.com/en/library/anatomy/cellular-organelles
5. http://www.iupui.edu/~anatd502/lecture.f04/cell.f04/Nucleus.pdf

| Mapping with programme outcomes | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Cos** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** |
| **CO1** | L | L | M | L | L | M | L | S |
| **CO2** | M | M | M | L | L | M | L | S |
| **CO3** | S | S | M | M | L | S | M | S |
| **CO4** | S | S | M | M | L | M | S | S |
| **CO5** | S | S | M | S | L | M | S | S |
| **CO6** | S | S | S | S | L | M | S | S |

* S- Strong, M- Medium, L- Low

## CELL BIOLOGY – PRACTICAL

(Subject code: 23UZOC32)

**Semester: III** **Core: Practical 3** **Credits: 3** **Hours: 3**

**Course Objectives:**

- Illustrate that the Cell being the fundamental structural unit defines the function of all living things.
- Obtain knowledge of the structures and functions of basic components of prokaryotic and eukaryotic cells, especially macromolecules, membranes, and organelles.
- Understand the cellular components underlying cell division. Compare and contrast the events of the cell cycle and its regulation. Explain the communications of cells with other cells and to the environment.

1. Compound microscope – Setting and handling procedures
2. Squash preparation of onion root tip for mitotic stages
3. Squash preparation of grasshopper testis for meiotic stages
4. Smear preparation of human blood for RBC/WBC observation
5. Differential count of WBC
6. Study of Polytene chromosomes from Chironomous / Drosophila larvae
7. Extraction, isolation and quantification of DNA (animal samples)
8. Smear preparation of squamous epithelium of human buccal cavity.
9. Separation and isolation of cells by sedimentation.
10. Cell size measurement by micrometer.
11. Isolation of mitochondria.
12. Observation of yeast cell (Eukaryotic cell)

**Spotter**: Plasma membrane, Mitochondria, Ribosomes, Lysosomes, Endoplasmic reticulum, nucleus, Nucleolus, Golgi complex, Centrioles, Types of chromosomes, Ultra structure of chromosomes, Cell secretion, DNA double helix, Variants of double helical DNA, Protein synthesis, DNA- Replication, Structure of Lac operon, DNA repair, Types of Mutation

**ALLIED BOTANY-III**
**PLANT SCIENCE – I**
**(SUB.CODE: 23UBOE31)**

| SEMESTER – III | EC – T3 | HOURS –4 | CREDITS – 3 |
|---|---|---|---|

**Course outcomes:**
**On completion of this course, the students will be able to:**
**CO1:** To study morphological and anatomical adaptations of plants of various habitats.(K1)
**CO2:** To demonstrate techniques of plant tissue culture.(K2)
**CO3:** To familiarize with the structure of DNA, RNA. (K3)
**CO4:** To carryout experiments related with plant physiology.(K4)
**CO5:** To perform biochemistry experiments (K5)

**Unit I- Virus and Bacteria** **(12 Hours)**

Virus - general characters, structure of TMV, structure of bacteriophage. Bacteria - general characters, structure and reproduction of *Escherichia coli* and economic importance of bacteria.

**Unit II–Algae and Fungi** **(12 Hours)**

General characters of algae - Structure, reproduction and life cycle of the following genera of *Anabaena* and *Sargassum* and economic importance of algae.
General characters of fungi, structure, reproduction and life cycle of the following genera – *Penicillium* and *Agaricus* and economic importance of fungi.

**Unit III -Bryophytes, Pteridophytes and Gymnosperms** **(12 Hours)**

General characters of Bryophytes, Structure and life cycle of *Marchantia.*
General characters of Pteridophytes, Structure and life cycle of *Lycopodium.*
General characters of Gymnosperms, Structure and life cycle of *Cycas*.

**Unit IV –Plant Physiology** **(12 Hours)**

Photosynthesis overview, C3 and C4 cycle; Nitrogen metabolism. Transpiration - ; Photoperiodism, Vernalization & Seed germination.

**Unit V- Plant Biotechnology** **(12 Hours)**

Plant tissue culture – Media preparation - *In vitro* culture methods – direct & indirect organogenesis. Plant tissue culture and its application in biotechnology.

**Recommended Texts:**


1. Singh,V.,Pande, P.Cand Jain,D.K. 2021. A Text Book of Botany. Rastogi Publications, Meerut.
2. Bhatnagar, S.P and AlokMoitra. 2020. Gymnosperms, New Age International (P) Ltd., Publishers, Bengaluru.
3. Sharma,O.P.2017. Bryophyta, MacMillan India Ltd. Delhi.
4. Lee, R.E. 2008. Phycology, IV Edition, Cambridge University Press, New Delhi.
5. Rao, K., Krishnamurthy, K.V and Rao, G.S. 1979. Ancillary Botany,S. Viswanathan Pvt. Ltd., Madras

**Reference books:**


1. Parihar, N.S. 2012. An introduction to Embryophyta – Pteridophytes - Surjeet Publications, Delhi.
2. Alexopoulos, C.J. 2013. Introduction to Mycology. Willey Eastern Pvt. Ltd.
3. Vashishta, P.C. 2014. Botany for Degree Students Gymnosperms. Chand & Company Ltd, Delhi.
4. Coulter, M. Jhon, 2014. Morphology of Gymnosperms. Surjeet Publications, Delhi.
5. Vashishta, P.C. 2014. Botany for Degree Students Algae. 2014. Chand & Company Ltd, Delhi.
6. Parihar, N.S. 2013. An introduction to Embryophyta –Bryophytes -, Surjeet Publications, Delhi.
7. Pandey B.P. 1986, Text Book of Botany (College Botany) Vol I &II, S.Chand and Co. New Delhi.


**Mapping with Programme Outcomes:**

| COs | PO1 | PO2 | PO3 | PO4 | PO5 | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 |
|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| CO2 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| CO3 | 2 | 3 | 3 | 3 | 3 | 1 | 3 | 3 | 3 | 3 |
| CO4 | 3 | 3 | 2 | 3 | 3 | 3 | 2 | 3 | 2 | 3 |
| CO5 | 3 | 2 | 2 | 2 | 2 | 2 | 2 | 1 | 2 | 1 |

**S-Strong (3) M-Medium (2) L-Low(1)**

**ALLIED BOTANY-III**
**PLANT SCIENCE – I - PRACTICAL**
**(SUB.CODE: 23UBOE32)**

| SEMESTER – III | EC – P3 | HOURS –2 | CREDITS – 2 |
|---|---|---|---|

**Course outcomes:**

**On completion of this course, the students will be able to:**

**C1:** To enhance information on the identification of each taxonomical group by developing the skill-based detection of the morphology and microstructure of microorganisms, algae, and fungi.(K1)

**C2:** To comprehend the fundamental concepts and methods used to identify Bryophytes, Pteridophytes and Gymnosperms through morphological changes and evolution, anatomy and reproduction.(K2)

**C3:** To be familiar with the basic concepts and principles of lower group of plants.(K3)

**C4:** Understandingoflawsofinheritance,geneticbasisoflociand alleles. (K4)

**C5:** To learn about basic cell biology (K5)

**EXPERIMENTS**

1. Make suitable micro preparation of the types prescribed in Algae, Fungi, Bryophytes, Pteridophytes and Gymnosperms.

2.Demonstration experiments

a) Ganong's potometer
b) Ganong's respiroscope
c) *Ganong's light screen experiment*
d) *Clinostat*

3. Spotters - Algae, Fungi, Bryophytes, Pteridophytes, Gymnosperms and Angiosperm and Plant Biotechnology.

**Recommended Texts:**

1. Sharma,O.P.2017. Bryophyta, Mac Millan India Ltd, New Delhi.
2. Sharma,O.P.2012. Pteridophyta,Tata McGraw-Hills Ltd, New Delhi.
4. Benjamin, A. Pierce. 2012. Genetics- A conceptual Approach. W.H. Freeman and Company,
New York, England.

**Reference Books:**

1. Strickberger, M.W. 2005. Genetics (III Ed). Prentice Hall, New Delhi, India.
2. Nancy Serediak and M. Huynh. 2011. Algae identification lab Guide. Accompanying manual to algae identification field guide, Ottawa Agriculture and Agri food Canada publisher.
3. Mohammed Gufran Khan, Shite Gatew and BediluBekele. 2012. Practical manual for Bryophytes and Pteridophytes. Lambert Academic Publishing.

**Mapping with Programme Outcomes:**

| COs | PO1 | PO2 | PO3 | PO4 | PO5 | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 |
|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| **CO2** | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| **CO3** | 2 | 3 | 3 | 3 | 3 | 1 | 3 | 3 | 1 | 3 |
| **CO4** | 3 | 3 | 2 | 3 | 3 | 3 | 3 | 2 | 3 | 3 |
| **CO5** | 3 | 2 | 2 | 2 | 2 | 2 | 2 | 1 | 2 | 2 |

**S-Strong (3)** **M-Medium (2)** **L-Low(1)**

## ANIMAL HUSBANDRY

**(Subject Code: 23UZON31)**

**Semester: III SEC 5 Credits: 2 Hours 2**

**Course Outcomes:**

| At the end of the course, the students will be able to | | |
|---|---|---|
| CO1 | Define livestock production and management. | **K1** |
| CO2 | Demonstrate different breeds of livestock | **K2** |
| CO3 | Examine the product, nutritional and economic values of livestock | **K3** |
| CO4 | Categorize the common diseases and give appropriate treatments. | **K4** |
| CO5 | Justify the role of livestock in Indian economy and human health | **K5** |
| CO6 | Devise strategies for sustainable livestock farming | **K6** |

**K1** - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6**– Create

**Unit 1: Dairy farming (6 Hours)**

Cattle breeds (indigenous and exotic); housing of dairy animals, dairy products; nutritive value of milk; Lactometer

**Unit II: Poultry farming (6 Hours)**

Poultry house; Management of chicks, growers, and layers; Management of broilers and layers; Nutritional requirement for different stages of layers and broilers; common poultry diseases, their control and prophylaxis.

**Unit III: Goat and Sheep farming (6 Hours)**

Breeds of Indian goats and sheep; Exotic breeds of goats and sheep; Nutrition requirements; Housing and management of lambs and kids; Common diseases and vaccination.

**Unit IV: Rabbit farming (6 Hours)**

Rabbit breeds; nutritional requirement; housing, caring and farm management.

**Unit V: Pig Farming (6 Hours)**

Pig breeds; housing and maintenance of pigs, nutritional requirements; care during weaning; common diseases and their management.

**Text Book:**


1. Banerjee, G.C. 2010. Text book of animal husbandry, Oxford & IBH Publishing company Pvt. Ltd, New Delhi, India.
2. Arumugam, N., Jeyasurya, Nair, N.C., Soundarapandian, N., Thangamani, A., Narayanan, L.M., Leelavathi, S., Murugan, T., Prasanna Kumar, S., Johnson Rajeshwar, J. and Ram Prabu, R. 2013. Economic Zoology, Saras publication, Nagerkoil.

**Reference Book:**

1. Sandeep Tomar 2011. Basic operations of Animal husbandry, Oxford Publishers, New Delhi.

**E-resources**

1. http://www.agrifarming.in/rabbit-farming/
2. http://www.sheepfarm.in/goat-sheep-farming-business-plan

| Mapping with programme outcomes | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **COs** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** |
| **CO1** | L | M | M | L | L | M | L | M |
| **CO2** | L | M | M | L | L | M | M | M |
| **CO3** | M | M | M | L | L | M | M | M |
| **CO4** | S | M | L | M | S | S | M | M |
| **CO5** | S | S | S | M | S | S | S | M |
| **CO6** | S | S | S | M | S | S | S | M |

* S- Strong, M- Medium, L- Low

## BIO CHEMISTRY

(Subject code: 23UZOC41)

**Semester: IV** **Core: Theory 4** **Credits: 4** **Hours: 4**

**Course objectives:**
Prepare Students to know about the molecules of biological importance, and to inculcate the basic knowledge on the step-by-step biochemical reactions in a cell.

**Course Outcomes:**

| At the end of the course the students will be able to | | |
|---|---|---|
| CO1 | Define biomolecules and their properties | **K1** |
| CO2 | Describe the major biochemical pathways in the biological system | **K2** |
| CO3 | Determine the general three-dimensional structure of the highlighted molecules | **K3** |
| CO4 | Classify the molecules based on their structure and properties | **K4** |
| CO5 | Recognize deficiency and metabolic diseases | **K5** |
| CO6 | Build models on cell metabolism | **K6** |

**K1** - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6**– Create

**Unit I: Small molecules of biological importance** **(12 Hours)**
Atoms, inorganic and organic compounds, bonds, Properties of water, buffers, biologically important buffers; Diffusion, Osmosis and Viscosity. Acid-base concepts, concepts of pH, factors affecting pH and role of pH in biological systems.

**Unit II: Carbohydrates** **(12 Hours)**
Carbohydrates: structure, properties, classification; Monosaccharides, Oligosaccharides and Polysaccharides; Metabolism - Glycolysis, Kreb's cycle, Electron transport chain and oxidative phosphorylation. Glycogenesis, Glycogenolysis, Gluconeogenesis, HMP shunt, Glyoxylate cycle.

**Unit III: Lipids** **(12 Hours)**
Lipids: structure, properties, classification and fatty acids, biosynthesis of saturated fatty acids – palmitic acid; β oxidation of fats.

**Unit IV: Amino acids and Proteins** **(12 Hours)**
**Amino acids:** structure, properties, classification, transamination, deamination and biosynthesis of urea.
**Protein:** properties, classification, structural organization – primary (peptide bond), secondary (α and β), tertiary (myoglobin) and quaternary (haemoglobin) structure; biological importance of proteins.

**Unit V: Nucleic acids, Enzymes and Vitamins** **(12 Hours)**
Chemistry of DNA, Nitrogen bases, nucleosides, nucleotides, variants of DNA, and types of RNA; Enzymes - Classification, mechanism of action and factors influencing enzyme action; enzyme inhibition. Vitamins: Types, sources, structure of vitamin A, D, B1 and $B_2$, deficiency manifestation.

**Textbooks:**


1. Arumugam N et al., (2014). Biochemistry. Saras Publication.
2. Satyanarayana U et al., (2013). Essentials of biochemistry. Books and allied (P) Ltd.
3. Ambika Shanmugam, (2011). Fundamentals of biochemistry for medical students. Arthur's Publication
4. Rastogi SC, (2010). Biochemistry, 3rd edition. Tata McGraw Hill Education Pvt. Ltd.
5. Jain JL et al., (2010). Fundamentals of biochemistry. S Chand and Co Ltd.
6. Power CB, Chatwal GR, (2008). Biochemistry. Himalaya Publishing House.
7. Veerakumari L, (2005). Biochemistry. MJP Publishers.


**Reference books:**


1. Keith Wilson, John Walker, (2017). Biochemistry and molecular biology. Cambridge University Press.
2. Michael M Cox, David L Nelson, (2010). Lehninger's principles of biochemistry, 5th edition. WH Freeman and Co.
3. Mary K Campbell, Shawn O Farrell, (2009). Introduction to biochemistry. Cengage learning.
4. Voet *et al*., (2008). Principles of biochemistry. John Wiley & Sons, Inc.
5. William H Elliott, Daphne C Elliott, (2007). Biochemistry and molecular biology. Oxford University Press.
6. Lubert Stryer, (2000). Biochemistry. CBS Publishers & Distributors.
7. Victor W Rodwell, (2000). Harper's review of biochemistry. Lango Medical Publication.


**E-resources:**

1. https://themedicalbiochemistrypage.org/
2. http://www.cellimagelibrary.org/home
3. https://www.proteinatlas.org/
4. https://www.brenda-enzymes.info/
5. https://biochem.oregonstate.edu/undergraduate/educational-resources
6. https://www.biochemistry.org/
7. http://videolectures.net/Top/Biology/Biochemistry/
8. https://courses.nextgenu.org/course/resources.php?id=257

| Mapping with programme outcomes | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **COs** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** |
| **CO1** | L | L | M | L | L | M | L | S |
| **CO2** | M | M | M | L | L | M | L | S |
| **CO3** | S | S | M | M | L | S | M | S |
| **CO4** | S | S | M | M | L | M | S | S |
| **CO5** | S | S | M | S | L | M | S | S |
| **CO6** | S | S | S | S | L | M | S | S |

* S- Strong, M- Medium, L- Low

## BIOCHEMISTRY – PRACTICAL

(Subject code: 23UZOC42)

**Semester: V** **Core: Practical 4** **Credits: 2** **Hours: 2**

**Course Outcomes:** At the end of the course the students will be able to

- Interpret structure-functional relationships of carbohydrates, proteins and lipids.
- Describe the structure and role of purines and pyrimidines in nucleic acids and their types, cot curves, Hypo-hyperchromicity of DNA.
- Be familiar with enzymes, the mechanism of action of enzymes; coenzymes, co-factors, Isozymes; kinetics of enzyme catalyzed reactions and enzyme inhibitions and regulatory process.
- Learn about basic laboratory techniques and equipments used in biochemistry.
- Perform qualitative analysis to characterize the properties of various biomolecules and determine the effect of pH and temperature on salivary enzymes.

1. Qualitative analysis of carbohydrates
2. Determination of Glucose Concentration by Nelson's Method
3. Qualitative analysis of proteins
4. Qualitative analysis of amino acids
5. Qualitative analysis of fats
6. Preparation of buffer and molar solutions
7. Determination of pH in water samples
8. Absorption maxima of coloured solution using colorimeter.
9. Separation of amino acids and determination of Rf value by paper chromatography
10. **Spotters:** Structure of glucose, Starch, Secondary structure of protein, Myoglobin, Haemoglobin, Oleic acid, Cyclic AMP, Urea cycle, Kreb cycle, Structure of DNA, Structure of RNA-Types, Enzyme action- lock and key model, Induced fit model; Fat soluble and water-soluble vitamins, Instruments**:** pH meter, colorimeter, Paper chromatography, gel electrophoresis, spectrophotometer and centrifuge.

**ALLIED BOTANY – IV**
**PLANT SCIENCE - II**
**(SUB.CODE: 23UBOE41)**

| SEMESTER – IV | EC – T4 | HOURS –4 | CREDITS – 4 |
|---|---|---|---|

**Course outcomes:**
**On completion of this course, the students will be able to:**
**C1:** To be familiar with the basic concepts and principles of plant systematics.(K1)
**C2:** Learn the importance of plant anatomy in plant production systems.(K2)
**C3:** Understand the mechanism underling the shift from vegetative to reproductive phase.(K3)
**C4:** To learn about the physiological processes that underlie plant metabolism.(K4)
**C5:** To know the energy production and its utilization in plants. (K5)

**Unit I- MORPHOLOGY OF FLOWERING PLANTS (12 Hours)**

Plant and its parts.Structure and function of root and stem.Leaf and its parts.Leaf types- simple and compound.Phyllotaxy and types. Inflorescence - Racemose, Cymose and Special types. Terminology with reference to flower description.

**Unit II- TAXONOMY (12 Hours)**

Study of the range of characters and plants of economic importance in the following families: Rutaceae, Caesalpiniaceae, Asclepiadaceae, Euphorbiaceae and Cannaceae.

**Unit III- ANATOMY (12 Hours)**

Tissue and tissue systems: Simple and complex tissues. Anatomy of monocot and dicot roots - anatomy of monocot and dicot stems - anatomy of dicot and monocot leaves.

**Unit IV-EMBRYOLOGY (12 Hours)**

Structure of mature anther and ovule - Types of ovules, structure of embryo sac, pollination -double fertilization, structure of dicotyledonous and monocotyledonous seeds.

**Unit V – PLANT BREEDING (12 Hours)**

Plant Breeding – scope & importance, introduction, acclimatization, types of selection, hybridization – procedure, heterosis. Role of polyploidy in crop improvement.

**Recommended Texts:**


1. Sharma, O.P. 2017. Plant Taxonomy. (II Edition).The McGraw Hill Companies.
2. Bhojwani, S.S. Bhatnagar, S.P and Dantu, P.K. 2015. The Embryology of Angiosperms (6th revised and enlarged edition). Vikas Publishing House, New Delhi.
3. Maheshwari, P. 1963. Recent Advances in Embryology of Angiosperms. Intl. Soc. Plant Morphologists, New Delhi.
4. Salisbury, F. B.C.W. Ross.1991. Plant Physiology. Wassworth Pub. Co. Belmont.
5. Ting, I.P. 1982. Plant Physiology. Addison Wesley Pb. Philippines


**Reference books:**


1. Lawrence.G.H.M. 1985. An Introduction to Plant Taxonomy, Central Book Depot, Allahabad.
2. Bhojwani, S.S and Bhatnagar, S.P. 2000. The Embryology of Angiosperms (4th revised and enlarged edition). Vikas Publishing House, New Delhi.
3. Pandey, B.P. 2012. Plant Anatomy. S Chand Publishing.

4. Jain, VK. 2006. Fundamentals of Plant Physiology, S. Chand and Company Ltd.
5. Rajni Gupta. 2012. Plant Taxonomy: Past, Present and Future. Vedams (P) Ltd. New Delhi.
6. Jain, V.K. 2006. Fundamentals of Plant Physiology, S.Chand and Company Ltd., New Delhi.
7. Verma, S.K. 2006. A Textbook of Plant Physiology, S.K.Chand& Co., New Delhi.

**Mapping with Programme Outcomes:**

| COs | PO1 | PO2 | PO3 | PO4 | PO5 | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 |
|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| CO2 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| CO3 | 2 | 3 | 3 | 3 | 3 | 1 | 3 | 3 | 3 | 3 |
| CO4 | 3 | 3 | 2 | 3 | 3 | 3 | 3 | 2 | 3 | 2 |
| CO5 | 3 | 2 | 2 | 2 | 2 | 2 | 2 | 1 | 2 | 2 |

**S-Strong (3)** **M-Medium (2)** **L-Low(1)**

**ALLIED BOTANY – IV - PRACTICAL**
**PLANT SCIENCE – II - PRACTICAL**
**(SUB.CODE: 23UBOE42)**

| SEMESTER – IV | EC – P4 | HOURS –2 | CREDITS – 2 |
|---|---|---|---|

**Course outcomes:**
**On completion of this course, the students will be able to:**
**C1:** To enhance information on the identification of each taxonomical group by developing the skill-based detection of the morphology (K1)
**C2:** To comprehend the fundamental concepts and methods used to identify angiosperms through morphological changes and evolution, anatomy, Embryology and reproduction.(K2)
**C3:** To be familiar with the basic concepts and principles of plant systematics.(K3)
**C4:**Understanding of physiology in plants. (K4)
**C5:** To learn about the physiological processes that underlie plant metabolism(K5)

**EXPERIMENTS**

1. To describe in technical terms, plants belonging to any of the family prescribes and to identify
the family.
2. To dissect a flower, construct floral diagram and write floral formula.
3. To make suitable micro preparations of anatomy materials prescribed in the syllabus.
Hybridization techniques – emasculation
4. Spotters – Anatomy and Embryology

**Recommended Texts:**
1. Subramaniam, N.S. 1996. Laboratory Manual of Plant Taxonomy.Vikas Publishing House Pvt. Ltd., New Delhi.
2. 5.Noggle G.R and G.J. Fritz. 2002. Introductory Plant Physiology. Prentice Hall of India, New Delhi.

**Reference Books:**
1. Aler Gingauz.2001. Medicinal Chemistry. Oxford University Press & Wiley Publications.
2. Steward, F.C. 2012. Plant Physiology Academic Press, US

**Mapping with Programme Outcomes:**

| COs | PO1 | PO2 | PO3 | PO4 | PO5 | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 |
|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| CO2 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| CO3 | 2 | 3 | 3 | 3 | 3 | 1 | 3 | 3 | 1 | 3 |
| CO4 | 3 | 3 | 2 | 3 | 3 | 3 | 3 | 2 | 3 | 3 |
| CO5 | 3 | 2 | 2 | 2 | 2 | 2 | 2 | 1 | 2 | 2 |

**S-Strong (3) M-Medium (2) L-Low(1)**

## AQUACULTURE

(Subject code: 23UZON41)

**Semester: IV** **SEC: 6 (optional)** **Credits: 2** **Hours: 2**

**Objective:** To introduce and familiarize the basic and aspects of culture practices of both fin fishes and shell fishes, feeding and breeding techniques and help the students to pursue higher studies and research and job opportunities in aquaculture

**Course Outcomes:**

| At the end of the course the students will be able to | | |
|---|---|---|
| CO1 | Recollect the basic knowledge about important cultivable fin fishes. | **K1** |
| CO2 | Understand the modern techniques and methods of fishery industries | **K2** |
| CO3 | Determining ornamental fish breeding which is highly professional | **K3** |
| CO4 | Categorize commercially important edible fishes | **K4** |
| CO5 | Validating the importance of supplementary fish feeds and Artificial feed preparation. | **K5** |
| CO6 | Create and construct fishponds for aquaculture | **K6** |

**K1** - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6**– Create

**Unit I: Pond construction and management** **(6 hours)**

Aquaculture-Global scenario, Present status in India and Tamil Nadu; Fish pond construction- site selection; types of ponds, water quality analyses, liming and fertilization, morphology and commercial characteristics of cultivable fishes, culture practice, predator and weed control.

**Unit II: Fin fish culture** **(6 hours)**

Composite fish culture (Indian Major Carps and Murrels); Sewage fed fish culture and integrated fish culture, Marine water fish culture.

**Unit III: Shellfish and seaweed culture** **(6 hours)**

Culture of prawns, edible and pearl oysters, adaptive management; Seaweeds- types and culture practices.

**Unit IV: Feeding and breeding** **(6 hours)**

Live feed organisms – Artemia and rotifers culture; Fish feed - types, formulation and preparation, techniques, Importance of artificial feeding; Breeding – Bundh breeding and hypophysation; rearing of hatchlings, fry and fingerlings.

**Unit V: Aquaculture techniques** **(6 Hours)**

Identification of cultivable fish species; Morphometry of pond (Enclosed rectangular method/Shore length/ shore area and shoreline development); Breeding techniques - natural seed collection and artificial seed production (artificial fertilization and hypophysation).

**Textbooks:**


1. Rath, AK (2011). Freshwater Aquaculture, Third Edition, Scientific Publishers, Jodhpur, India.
2. Arumugam N (2008). Aquaculture. Saras publications.
3. Santhanam R, Sukumaran N (2000). Manual of freshwater aquaculture. SugainnaPathipagam.
4. Shanmugam K (2000). Fishery biology and aquaculture. Leo Marca Ashram.
5. Srivastava CBL, (2000). Textbook of fishery science and Indian fisheries. Kitab Mahal.
6. Ninawe AS, Khedkar GD, (2009). Nutrition in aquaculture. Narendra Publishing House.


**Reference Books:**


1. Jhingran VG (2000). Fish and fisheries of India. Hindustan Publishers.
2. Peter B Moyle, Joseph J Cech, (2004). Fishes an introduction to ichthyology, 5th edition, PHI Learning Pvt. Ltd.
3. Baeumont Hoare K, (2000). Biotechnology and genetics in fisheries and aquaculture. Blackwell Publishing.
4. Landau Matthew, (2000). Introduction to aquaculture. John Wiley & Sons Inc.


**E-resources**

1. http://agritech.tnau.ac.in/fishery/fish_freshwaterprawn.html
2. http://www.fao.org/3/contents/6c2f5977-bc3e-528e-b90f-ee63c7605e27/AC417E00.htm
3. http://nacogdoches.agrilife.org/files/2011/06/feeding_fish_7.pdf
4. https://www.slideshare.net/SameerChebbi1/freshwater-brackish-water-and-marine-fish-culture-of-india-by-dr-s-g-chebbi

| Mapping with programme outcomes | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **COs** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** |
| **CO1** | S | S | S | S | S | S | S | S |
| **CO2** | S | S | S | S | S | M | M | S |
| **CO3** | S | S | S | M | S | S | M | S |
| **CO4** | S | S | S | M | L | M | S | S |
| **CO5** | S | S | S | S | L | S | S | S |
| **CO6** | S | S | S | S | L | M | S | M |

* S- Strong, M- Medium, L- Low

## WILDLIFE AND NATURE WATCH

(Subject code:23UZON41)

**Semester: IV SEC: 6 Credits: 2 Hours: 2**

**Objective**: To expand the knowledge of the underlying conceptual and theoretical framework required by conservation biologist.

**Course Outcomes:**

| At the end of the course the students will be able to | | |
|---|---|---|
| CO1 | Outlining the significance and need of conserving resources. | **K1** |
| CO2 | Categorizing the distribution and diversity of fauna. | **K2** |
| CO3 | Organizing various strategies adopted in the conservation of various species. | **K3** |
| CO4 | Integrating the necessity of forensics related to wildlife crimes. | **K4** |
| CO5 | Examine conservation issues along a spectrum ranging from individual animals to populations, reintroductions, habitat restoration and anthropogenic sources of conflict | **K5** |
| CO6 | Create awareness to students explore biodiversity for new product development. | **K6** |

**K1** - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6**– Create

**Unit I : Wildlife in India (6 Hours)**

Definition, WWF India, Brief account of National Parks, Biosphere Reserve, World Network of Biosphere Reserves, Wild life sanctuaries, Tiger Reserves and project Tiger; National & State symbols.

**Unit II : Tools and Techniques (6 Hours)**

Tools - Trial and digital cameras, Track plates, GPS Units, Binoculars, Wildlife Callers; Techniques – count, tracking, capturing-marking-recapture, genetic sample collection, census, radio-telemetry, Pugmarks, traps, radio-telemetry.

**Unit III : Wildlife Biology and Conservation (6 Hours)**

Biology of selected wild animals of Western Ghats; Snakes of India - identification of venomous and non-venomous snakes, first aid for snake bite; Wildlife conservation– principles, needs and efforts in India.

**Unit IV: Bird Watching (6 Hours)**

Birds of Tirunelveli district, Morphology of birds, Bird behaviour, Silhouette: Shape, Size, Bird flight.

**Unit V: Eco-Ethics** **(6 Hours)**

Wildlife tours - Dress code, Behaviour code, Do's and Don'ts, Zoo behaviour; Eco-living, Man-wildlife conflicts, Man-eaters.

**Text books:**

1. Prater, S.H. 1974. The Books of Indian Mammals, Oxford University Publication, New Delhi
2. Salim Ali, 1996. Birds of Indian Subcontinent, Bombay Natural History Society publication, Bombay.

**Reference Books:**

1. Richard Grimmet, 2007. Princeton field guide Birds of India,
2. Romulus Whitaker2004. Common Indian Snakes, Oxford University Publication, New Delhi
3. Jim Corbett, 2001. Man-eaters of Kumaon, Oxford India Publications, Chennai.
4. Jim Corbett, 2001. Man eating leopard of Rudraprayag. Oxford India Publications, Chennai.

**E-resources**

1. www.wii.gov.in
2. www.wwfindia.org
3. www.bnhs.org
4. www.indianjungles.com
5. www.sanctuaryasia.com
6. www.cranes.org

| Mapping with programme outcomes | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **COs** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** |
| **CO1** | S | S | S | S | S | S | S | S |
| **CO2** | S | S | M | M | S | S | M | S |
| **CO3** | S | M | M | M | S | S | S | M |
| **CO4** | S | M | S | M | S | M | S | S |
| **CO5** | S | M | M | M | S | S | S | S |
| **CO6** | S | S | S | M | S | M | S | M |

* S- Strong, M- Medium, L- Low

## BIOSTATISTICS

(Subject code: 23UZOS42)

**Semester: IV** **SEC: 7** **Credits: 2** **Hours: 2**

**Objective:** To understand and apply the basic biostatistical methods and use of computer applications to solve common and scientific problems in science.

**Course Outcomes:**

| At the end of the course, the students will be able to | | |
|---|---|---|
| CO1 | Defining measures that can be used to summarize a data set: mean, median, mode, percentiles, variance, standard deviation and range . | **K1** |
| CO2 | Understand the basics of data collection, categorization and presentation | **K2** |
| CO3 | Experimenting with common types of statistical analyses of continuous, discontinuous data and applying the knowledge in the future course of their career development in higher education and research | **K3** |
| CO4 | Distinguishing different applications of computers in biology, using MS –word, MS –Excel and MS-Powerpoint. | **K4** |
| CO5 | Ratingscientific problems by applying statistical formulas. | **K5** |
| CO6 | Writing basic concepts of primary and secondary data | **K6** |

**K1** - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6**– Create

**Unit I: Data–collection, categorization and presentation** **(6 Hours)**

Types of data: Primary and secondary data collection; Methods, merits and demerits, sampling error; Categorization **-** ungrouped and grouped data with continuous and discontinuous series

**Unit II: Data-Presentation and Tabulation** **(6 Hours)**

Presentation – Tabulation and Diagrammatic presentation –line, bar diagram, pie diagram, histogram.

**Unit III: Measures of central tendency and dispersion** **(6 Hours)**

Arithmetic mean, median, mode, standard deviation and standard error.

**Unit IV: Tests of significance** **(6 Hours)**

Chi-square test, Functions–significance tests (*t*, Z, F)

**Unit V: Correlation and Regression** **(6 Hours)**

Correlation, Regression (simple problem), regression line

**Textbooks:**


1. Ramakrishnan, P. 2015. Biostatistics, Saras Publication, Nagercoil.
2. Veer Bala Rastogi. 2011. Fundamentals of biostatistics, 2nd edition. Ane Books Pvt. Ltd.
3. Gurumani, N. 2010. An introduction to Biostatistics, Tamil Nadu Book House, Chennai.
4. Sanjay Saxena 2006. M.S. Office 2000 for every one, Rrevised edition IV, Vikas Publication Pvt. Ltd, New Delhi.


**Reference books:**


1. Ronald N Forthofer et al. 2007. Biostatistics a guide to design, analysis and discovery. Academic Press.
2. CliffordBlari, Richard A Taylor. 2009. Biostatistics for health sciences. Pearson education.
3. Negi KS. 2012. Methods in biostatistics with latest MCQs. AITBS Publishers.
4. Zar 2003. Biostatistical analysis (IV Ed.), Pearson Education, Singapore.
5. Annadurai, B. 2007. A Text Book of Biostatistics, 1st Edition
6. Bittu Kumar. 2013. Microsoft Office 2010. V & S Publishers; Latest Revised Edition, pp.208.


**E-resources**

1. http://www.nios.ac.in/media/documents/316courseE/E-JHA-31-10A.pdf
2. http://dspace.vpmthane.org:8080/jspui/bitstream/123456789/2836/1/Measures%20of%20Central%20Tendency.pdf
3. http://www.indiana.edu/~ensiweb/lessons/oat.stat.signif.pdf

| Mapping with programme outcomes | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **COs** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** |
| **CO1** | S | S | S | S | S | S | S | S |
| **CO2** | S | S | M | M | S | S | M | S |
| **CO3** | S | M | M | M | S | S | S | M |
| **CO4** | S | M | S | M | S | M | S | S |
| **CO5** | S | M | M | M | S | S | S | S |
| **CO6** | S | S | S | M | S | M | S | M |

**4.** * S- Strong, M- Medium, L- Low

## DEVELOPMENTAL BIOLOGY

(Subject code: 23UZOC51)

**Semester: V** **Core:Theory 5** **Credits: 5** **Hours: 6**

**Objective:** To understand the development and functioning of various organs as well as to know about the concepts, trends and patterns of animal development.

**Course Outcomes:**

| At the end of the course the students will be able to | | |
|---|---|---|
| CO1 | To know methodological approaches to the study of embryonic development and the characteristics of the principal experimental models. | **K1** |
| CO2 | Understanding embryonic sequences in developmental processes in order. | **K2** |
| CO3 | Categorizing the derivatives of embryonic structures. | **K3** |
| CO4 | Applying basic conceptual knowledge of the principal cellularmechanisms of development and identifying the genetic and molecular Elements that are involved. | **K4** |
| CO5 | Estimating development in applied sciences like Biotechnology, Genetic engineering and Molecular Biology | **K5** |
| CO6 | Building laws and concepts to describe evo-devo trends. | **K6** |

**K1** - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6**– Create

**UNIT I: Gametogenesis and Fertilization** **(15 Hours)**

Structure of mammalian ovary and testis; Spermatogenesis and Oogenesis- ovulation; Types of eggs; Fertilization - external and internal, physiological and chemical changes, post-fertilization changes; Parthenogenesis (General account).

**UNIT II: Cleavage, Fate Map and Gastrulation** **(15 Hours)**

Cleavage: rules, patterns and laws; Cleavage in Frog; Fate map and gastrulation; morphogenetic movements.

**UNIT III: Organizer and Organogenesis** **(15 Hours)**

Types of embryonic induction - structure, mechanism, and theories of induction; organizer concept; organogenesis - brain, eye, and heart in frog; Development of Pro, Meso and Metanephric kidneys.

**UNIT IV: Extra-embryonic Membranes and Placenta** **(15 Hours)**

Egg membranes; Development and factors involved in the formation of amnion, chorion, allantois and yolk sac - their function; Formation of extra-embryonic membranes in humans; Origin, types and functions of the placenta. Embryonic stem cells and significance.

**UNIT V Reproductive cycles and assisted technologies (15 Hours)**

Oestrous, Menstrual cycle and menopause, Pregnancy, Trimesters, fetal development, Twins – types. Infertility: causes; Diagnosis- Amniocentesis, Treatment: Assisted Reproductive Technology (IVF, GIFT, ZIFT, ICSI).

**Textbooks:**


1. Arumugam. 2009. Textbook of embryology. Saras Publications.
2. Veer Bala Rastogi, 2000. Developmental Biology. Kedarnath, Ramnath& Co.
3. Verma, P.S. and Agarwal, V.K. 1999. Chordate Embryology, Chand & Co. New Delhi.
4. Jain, P.C. 2000. Elements of developmental biology, Vishal Publications, Jalandhar.


**Reference Books:**


1. Twyman RM 2003. Developmental biology, Viva books Pvt. Ltd.
2. Banerjee.S 2005, A Textbook of Developmental Biology, Dominant Publishers and Distributors.
3. Werner A Muller 2005. Developmental biology. Springer Publications.
4. Balinsky, RJ. 1981. An Introduction to Embryology, CBS College Publishing, Holt, Rinehart and Winston.
5. Scott F. Gilbert 2000. Developmental biology. Sinaeur Associates Inc.


**E-Resources:**

1. https://plato.stanford.edu/entries/biology-developmental/
2. https://bastiani.biology.utah.edu/courses/3230/db%20lecture/lectures/a6cleav.html
3. https://organismalbio.biosci.gatech.edu/growth-and-reproduction/animal-development-ii/

| Mapping with programme outcomes | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **COs** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** |
| **CO1** | S | S | S | S | S | S | S | S |
| **CO2** | S | S | S | S | M | M | M | S |
| **CO3** | S | S | S | M | M | S | S | M |
| **CO4** | S | S | S | L | S | M | S | S |
| **CO5** | S | M | M | M | S | S | M | S |
| **CO6** | S | S | S | L | S | M | L | L |

* S- Strong, M- Medium, L- Low

## DEVELOPMENTAL BIOLOGY - PRACTICAL

(Subject code: 23UZOC53)

**Semester: V Core: Practical 5 Credits: 2 Hours: 2**

**Course Outcomes:**

- This course will help the students to understand the development of multicellular organisms from a single cell zygote.
- Students will be able to appreciate the mechanisms that support growth and development.
- They will learn interesting and unique post embryonic development that happens in other animals
- It will help them to understand the concept of aging and the relevance of this knowledge in several medical applications.

1. Temporary mounting of Chick blastoderm
2. Observation of developmental stages.
   Frog – Egg, cleavage, gastrulation, section through optic cup.
   Chick –24hrs, 33 hrs, 48hrs, 72hrs and 96 hrs
3. Drosophila – Life stages observation, Sex and mutant identification
4. Observation of Mosquito life stages
5. Placental types: Shark, platypus, sheep, rabbit, pig.
6. Teratology – abnormal development in animals.
7. Demonstration of fertilization, cleavage and gastrulation using models.
8. Regeneration - frog tadpole tail (demonstration)
9. Effect of iodine on metamorphosis of frog (optional/demonstration).
10. Spotters:Slides of mammalian sperm and Ovum, Different developmental stages of chick embryos(primitive streak, 24,48,72,96hrs), Blastula and gastrula of frog(morula, early gastrula, yolk plug stage, late gastrula), Placenta of fish,sheep,pig,platypus and rat.

## ECOLOGY

(Subject code: 23UZOC52)

**Semester: V** **Core: Theory 6** **Credits: 5** **Hours: 6**

**Course objectives:** Students have learned to provide basic and advanced scientific knowledge of various ecosystems; to help discover the reliability of animal species on each other; to comprehend the pathways by which chemical substances cycle between the biotic and abiotic compartments; to explain the necessity of adaptations in animals; to help acquire knowledge on the effects and monitoring of pollution; to appreciate the wealth of natural resources in the country and state and to prompt biodiversity conservation and management.

**Course Outcomes:**

| At the end of the course, the students will be able to | | |
|---|---|---|
| CO1 | Define the principles and basics of ecology | **K1** |
| CO2 | Learn population and animal relationships | **K2** |
| CO3 | Illustrate biogeochemical cycles and correlate the choice of habitat for organisms to abiotic factors | **K3** |
| CO4 | Classify natural resources | **K4** |
| CO5 | Recommend wildlife conservation approaches | **K5** |
| CO6 | Develop strategies to reduce, re-use and recycle for environmental protection | **K6** |

**K1** - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6**– Create

**Unit I: Concepts of Ecology** **(12 Hours)**

Definition and Scope, Biosphere, Biotic factors. Abiotic factors and its ecological roles - soil, light, temperature, water; Limiting factors. Ecosystem- concept, structure, types and function, Concept of species -Keystone species, Indicator species, Umbrella and flagship species. Population dynamics and growth curves, Population ecology, Community ecology.

**Unit II: Nutrient cycles and interactions** **(12 Hours)**

Biogeochemical cycles - Carbon, Oxygen, Nitrogen, Sulphur, Phosphorous. Food chain, food web, pyramids, trophic levels, energy flow. Animal relationship -Symbiosis, Commensalisms, Mutualism, Antagonism, (Antibiosis, Parasitism, Predation), Competition;

**Unit III: Habitat ecology** **(12 Hours)**

Characteristic features, types and faunal adaptations – Freshwater (Lotic and Lentic), Marine, Estuarine, Mangrove, Tundra, Savanna, Cave, Forest and Desert ecosystems. Ecotone & edge effect. Significance and conservation of wetlands; ecological succession& niche concepts. Manmade ecosystems - effects of dams, hydroelectric projects and aquaculture.

**Unit IV: Pollution and its control** **(12 Hours)**

Sources, causes, effects and management of - Land, Water, Air, Thermal and Pesticide pollution. Nuclear hazards – Management of Solid waste, Plastic waste, Medical waste and e-waste. Pollution control devices; Biomagnifications; Bioindicators and their role in environmental monitoring; Pollution control acts and regulations of India.

**Unit V: Natural resources and conservation** **(12 Hours)**

Natural resources – definition and types. Biodiversity - definition, value, loss and cause; biodiversity hotspots in India; IUCN, CITES &brief outline of Indian laws of conservation; Indian endangered species. Biodiversity conservation -*in situ* and *ex situ* - Community reserves, Sanctuaries, National parks, Tiger reserves in Tamil Nadu. Afforestation & Deforestation. Human-animal conflicts.

**Textbooks:**


1. Arumugam N, (2010). Ecology and toxicology. Saras Publications.
2. Verma PS, Agarwal VK, (2005). Principles of ecology. S Chand & Co. Ltd.
3. Tyagi PN, (2013). Textbook of ecology. Astha PuublishersDistributors.
4. Subrahmanyam NS, Sambamurty AVSS, (2011). Ecology, 2nd edition. Narosa Publishing House.
5. Mohan P Arora, (2000). Ecology, 4th edition. Himalaya Publishing House.
6. Sharma PD, (2000). Ecology and environment. Rastogi Publications.
7. Divan S, Rosencranz A. Environmental law and policy in India: Cases, materials and statutes. New Delhi: Oxford University Press.
8. Gupta PK, Cytology, Genetics & Evolution, Rastogi Publications, Meerut.


**Reference books:**


1. Michael PN, (2016). Ecology. CBS Publishers & Distributors Pvt. Ltd.
2. Eugene P Odum, (2014). Fundamentals of ecology. Cengage Learning.
3. Edward J Kormondy, (2013). Concepts of ecology, 4th edition. PHI Learning Pvt. Ltd.
4. Saha TK, (2010). Ecology and environmental biology. Books and allied (P) Ltd.
5. Peter J Russell et al., (2009). Ecology. Brooks/Cole Cengage Learning.
6. Charles S Elton, (2000). Animal ecology. Methuen & Co.
7. Robert E Rickleft, (2000). Ecology. Nelson and sons Ltd.


**E-resources**

1. https://www.gov.mb.ca/waterstewardship/fisheries_education_sustain_dev/education/outcomePages/grade10/pdf/cycle.pdf
2. https://en.wikipedia.org/wiki/Conservation_biology
3. http://download.nos.org/333courseE/10.pdf
4. http://bio1510.biology.gatech.edu/module-2-ecology/population-ecology/
5. https://www.cbd.int/2010/biodiversity/#tab=2

| Mapping with programme outcomes | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **COs** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** |
| **CO1** | L | L | M | L | L | M | L | S |
| **CO2** | M | M | M | L | L | M | L | S |
| **CO3** | S | S | M | M | L | S | M | S |
| **CO4** | S | S | M | M | L | M | S | S |
| **CO5** | S | S | M | S | L | M | S | S |
| **CO6** | S | S | S | S | L | M | S | S |

* S- Strong, M- Medium, L- Low

## ECOLOGY– PRACTICAL

(Subject code: 23UZOC54)

**Semester : V** **Core: Practical 6** **Credits:2** **Hours: 2**

- Demonstrate a broad understanding of the processes that shape the distribution and abundance of organisms from the micro-habitat to the globe.
- Recognize that the distribution of organisms is a product of positive and negative interactions within and across trophic levels, including competition, mutualism, predation, and parasitism.
- Analyze interactions within the context of specific habitats and judge how the habitat shapes the distribution and abundance of species. Key factors that influence the habitat include climate, energy input, spatial/temporal complexity, and resource availability.
- Evaluate the relationships among ecological interactions, habitat context and the evolution of organism form and function. Distinguish how the evolution of organism form and function influences ecological interactions and habitat tolerance and judge how ecological processes in turn shape the evolution of organism form and function.

1. Determination of pH of Soil and Water
2. Determination of primary productivity (dark and light bottle)
3. Transparency of water using Secchi disc
4. Analysis of freshwater and marine water planktons
5. Estimation of salinity (chlorides) of water samples
6. Estimation of dissolved oxygen of pond water, sewage water and effluents.
7. Determination of water hardness – Silicates and phosphates
8. Calculation of $LC_{50}$ /$LD_{50}$ using SPSS software
9. Mimicry : leaf insects, stick insects, monarch and Viceroy butterflies
10. Visit to a Wild Life Sanctuary/National Park/Zoo/Biosphere Reserve/Natural Ecosystems – Report submission (compulsory)
11. **Spotters :**Ecosystem - Aquatic (freshwater and Marine) and terrestrial (Grass land and forest); Pyramids (biomass, number and energy)- Animal inter relationship, (Parasitism, Commensalism, Mutualism), Food chain and food web, energy flow in an ecosystem, Biogeochemical cycle (Phosphorous, Nitrogen and Carbon); Instrumentations – field thermometer, anemometer, barometer, hygrometer and anemometer.

## GENETICS AND ANIMAL BIOTECHNOLOGY

(Subject code: 23UZOE51)

**Semester: V Elective: Theory 5 Credits: 3 Hours: 5**

**Objective:** To introduce and familiarize the basic aspects of genetics and to inculcate the knowledge of biotechnological tools and their application.

**Course Outcomes:**

| At the end of the course the students will be able to | | |
|---|---|---|
| CO1 | To know the Structural and functional aspects of Genes and Chromosomes | **K1** |
| CO2 | Understand Mendelian Principles and dominance | **K2** |
| CO3 | To understand concepts behind genetic disorders, gene mutations and various causes associated within- born errors of metabolism | **K3** |
| CO4 | The course will give an idea about the various techniques used in modern biotechnology. | **K4** |
| CO5 | Current applications of biotechnology and advancesin different areas such as medical, microbial, environmental, bioremediation, agricultural, animal and forensics. | **K5** |
| CO6 | To know the Structural and functional aspects of Genes and Chromosomes | **K6** |

**K1** - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6**– Create

**UNIT- I Mendelism and its deviations (15 hours)**

Mendel's law – Law of segregation and law of independent assortment, backcross and test cross. Allelic interaction- Incomplete dominance, Codominance, Complementary genes, Lethal genes, Reversion, Epistasis, Multiple allele inheritance - ABO blood groups, Rh factor; Polygenic inheritance – skin colour.

**UNIT – II Linkage, crossing over and sex linked inheritance (15 hours)**

Linkage and crossing over, linkage map; Sex determination in man and Drosophila; Gynandromorphism; sex linked inheritance in man and drosophila; non-disjunction, holandric genes, sex influenced and sex limited genes; Extra chromosomal inheritance- maternal inheritance.

**UNIT – III Human genetics and chromosomal alterations (15 hours)**

Human chromosomes; Abnormalities of chromosomes – Edward, Down's, Klinefelter's, Turner's syndromes, sickle cell anaemia; Inborn errors of metabolism -alkaptonuria, phenylketonuria; Chromosomal aberrations- deletion, duplication, inversion, translocation; Eugenic, euthenics and euphenics; Pedigree analysis

**UNIT – IV Genetic engineering (15 hours)**

rDNA technology-construction of recombinant DNA, gene transfer techniques (gene gun, electroporation, liposome-mediated), Selection and multiplication of recombinant host cells,

expression of cloned gene.Cloning vectors – pBR322, Ti plasmid, bacteriophage, DNA sequencing (Sanger's), cDNA libraries; Method of gene amplification- PCR.

**UNIT – V Applications of genetics** **(15 hours)**

Monoclonal antibodies, DNA finger printing, Biotechnological products-insulin, drugs, somatotropin production, Cloning method-Dolly; transgenic animals and their applications; Gene therapy and immunotoxins.

**Text books:**


1. Verma, P.S. and Agarwal,V.K. 1998. Concepts of Genetics, Human Genetics and Eugenics. S.Chand&Company Ltd, Ram Nagar,New Delhi.
2. Sambamurthy, A.V.S.S. 2010. Genetics, Narosa Publication, New Delhi
3. AjoyPaul ,(2012) Genetics, Books And Allied (P) Ltd.
4. N. Arumugam, LM. Narayanan, A. Mani A.M. Selvaraj, P. Singh, 2013. Genetic engineering, Saras publications
5. Dubey, R.C. 2001. A text book of biotechnology, S. Chand & Company, Ramnagar, New Delhi.


**Reference books**:


1. Gardner, Simmons and Snusted (2006). Principles of Genetics, JohnWiley& Sons, INC, New York.
2. Tamarin, R.H (2010). Principles of genetics, Tata McGraw Hill Publishing company, New Delhi.
3. Lewine Benjamin2007. Gene XII, Pearson Education International, New Jersey. Alice Marcus. 2009. Genetics, MJP publishers.
4. MichealFumento(2009),Biotechnology How It Is Changing Our Life, Jaico Publishing House.


**Online resources:**

1.https://www.coursera.org/learn/genetics-evolution
2.https://www.coursera.org/learn/genomics-research
3.https://www.genetics.org

| Mapping with programme outcomes | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **COs** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** |
| **CO1** | S | L | M | L | L | M | L | S |
| **CO2** | M | M | M | L | L | M | L | S |
| **CO3** | S | S | M | S | S | S | M | S |
| **CO4** | S | S | M | S | L | M | S | S |
| **CO5** | S | S | M | S | SS | M | S | S |
| **CO6** | S | S | S | S | L | M | S | S |

* S- Strong, M- Medium, L- Low

## GENETICS AND ANIMAL BIOTECHNOLOGY - PRACTICAL

(Subject code: 23UZOE52)

**Semester: V Elective: Practical 5 Credits: 1 Hours: 2**

**Course Objectives:**

- A understanding of the chemical basis of heredity
- The skills required to plan, carry out, and evaluate the outcomes of genetic experiments in animal model systems.
- Develop the necessary communication skills in the discipline required for Oral presentations of research results, and poster presentations at conferences etc.

1. Demonstration of Monohybrid and Dihybrid cross using colored beads.
2. Verification of Hardy – Weinberg's law using beads (partial )
3. Polygenic inheritance- Human height – weight
4. Variation in left thumb impression
5. Probability – Coin tossing (two coin only)
6. Isolation of casein from milk
7. Isolation of citric acid from lemon juice
8. Isolation of Protein –PAGE (Demonstration)
9. Isolation of DNA – AGE (Demonstration)
10. Demonstration of DNA amplification (PCR)
11. Cell viability test

13.**Spotters**: gene interaction- test cross, Incomplete dominance, Codominance, Complementary genes, Lethal genes, and Epistasis, Rh factor, Free-Martin, colour blindness, human abnormalities, hypertrichosis (holandric gene), chromosomal alterations, construction of recombination DNA, PCR, Monoclonal antibodies, DNA finger printing, insulin production, Cloning.

## EVOLUTION

(Subject code: 23UZOE53)

**Semester: V Elective: Theory 6 Credits: 4 Hours: 5**

**Objective:** To make the students understand the concepts, trends and patterns of evolution as well as the evolution of selected groups; to develop an idea of the adaptations and their significance with evolution; to understand the mechanism of natural selection; to compare adaptive features based on behavioral and natural selection; to construct a phylogenetic tree using molecular data.

**Course Outcomes:**

| At the end of the course the students will be able to | | |
|---|---|---|
| CO1 | To describe the history and development of evolutionary thought, list and describe the evidence for evolution and its required corollaries mechanisms by which evolution occurs. | **K1** |
| CO2 | To understand how phylogenetic trees should be constructed using molecular data. | **K2** |
| CO3 | To develop an idea of the adaptations and its significance with evolution | **K3** |
| CO4 | To implement speciation concepts to understand the patterns of evolution | **K4** |
| CO5 | To know the adaptive features and behavioral and natural selection | **K5** |
| CO6 | To devise evolutionary scientific thoughts based on advances in molecular studies | **K6** |

**K1** - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6**– Create

**Unit I: Evolutionary history and Origin of cells (15 hours)**

Evolutionary time scale: eras, period, and epoch; Major events in the evolutionary time scale, fossils; Origin of biomolecules, chemical and biological evolution of life; concepts of Oparin and Haldane-experimental evidences.

**Unit II: Paleontology and Evolutionary thoughts (15 hours)**

Lamarckism, Darwinism-, Natural selection in action, fitness and adaptive value, industrial melanism mutation theory and modern synthetic theory. Evolution of horse; Physical and cultural evolution of Man.

**Unit III: Patterns of evolution (15 hours)**

Speciation, concepts, Sequential and divergent evolution, isolating mechanisms; micro, macro and mega evolution; Adaptive radiation of reptiles, birds and mammals; migration, navigation, domestication.

**Unit IV: Behavioral Adaptation and Variation** **(15 hours)**

Mimicry and coloration- Batesianand Mullerian mimicry. Variation – pre-adaptation and post adaptation; normalizing, directional and diversifying selection; Group and individual selection, Altruism-Kin selection.

**Unit V: Molecular Evolution** **(15 hours)**

Principles of molecular evolution studies; methods of molecular evolution studies; DNA bar coding- mtDNA, molecular phylogeny– history, terms, definition and limitations, construction of phylogenetic trees using molecular data, construction of phylogenetic trees.

**Textbooks**


1. Arumugam N, (2010). Organic evolution. Saras Publication.
2. Veer Bala Rastogi, (2017). Organic evolution, 13th edition. Medtech Publisher.
3. Sanjib Chattopadhyay. (2011). Evolution, adaptation, ethology. Books and allied (P) Ltd.
4. Mohan P Arora, (2000). Evolutionary biology. Himalaya Publishing House.
5. Tomar SB, Singh PS, (2000). Evolutionary biology. Rastogi Publications.


**Reference Books**


1. Strickberger, M.W. 2005. Evolution. Jones and Bartett Publishers, London.
2. Jay M Savage (2000). Evolution. Amerind Publishing Company.
3. David J Merrell, (2000). Evolution and genetics. Holt, Rinehart and Winston Publishers.
4. Julian S Huxley (2000). Story of evolution. Rath bone Books.
5. Dobzhansky T et al., (1973). Evolution. Surjeet Publication, New Delhi.


**E - Resources**

1. https://openstax.org/books/biology/pages/18-1-understanding-evolution
2. https://biologydictionary.net/adaptive-radiation/
3. https://www.nationalgeographic.org/encyclopedia/paleontology/#:reserved%20in%20rock

| Mapping with programme outcomes | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **COs** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** |
| **CO1** | S | L | M | S | L | M | L | S |
| **CO2** | S | M | M | L | L | M | L | S |
| **CO3** | S | S | M | S | M | S | M | S |
| **CO4** | S | S | M | S | L | M | S | S |
| **CO5** | S | S | M | S | S | M | S | M |
| **CO6** | S | S | S | S | L | M | S | S |

* S- Strong, M- Medium, L- Low

## INTERNSHIP

**Semester : V** **Sub. Code: 23ZOI51** **Credits: 2**

- All UG students will undergo internship during the summer holidays of the second year after completing IV semester.
- Two credits will be given for internship.
- Minimum Days: 21
- Minimum working time per day: 3 Hrs. & Maximum working Time: 5 Hrs.
- The places of internship can be government offices, Panchayats, MP, MLA offices, private institutions, companies, production units etc.
- The HoD of the departments will give a letter of introduction to each student.
- The students will identify the company / institution for internship.
- The students will be divided equally based on the number of professors available in the departments. Each professor will serve as a guide to the assigned students.
- The students will finalize the institutions / companies for the internship in consultation with the guides.
- The students shall maintain a work diary which will be countersigned by the managers / authorities of the company in which the students do the internship on daily basis.
- The work diary, Work completion certificate obtained from the company and a comprehensive report on the learning outcomes will be submitted to the guides at the end of the internship.
- Viva will be conducted based on the experience of the internship in the month of August. The guide will be the internal examiner and another faculty from the same department will serve as the external examiner.

## ANIMAL PHYSIOLOGY

(Subject code: 23UZOC61)

**Semester: VI Core: Theory 7 Credits: 4 Hours: 5**

**Objective:** To enable the students to understand the general principle, and physiological functions of animals as well as to understand the nature, mechanism and uses of various receptors; to familiarize with the general principles and physiological functions of animals; to understand how various organ systems are coordinated and controlled; to give an idea about the regulation of organ system functions using a conceptual model of feedback; to create awareness on how structure-function relationships synchronise with the molecular signal and to develop the idea of multilevel controlling and feedback mechanism of various physiological functions.

**Course Outcomes:**

| At the end of the course the students will be able to | | |
|---|---|---|
| CO1 | Describe the physiological processes of all major body systems | **K1** |
| CO2 | Discuss the components and structure of each body system | **K2** |
| CO3 | Illustrate the functioning of individual organ systems | **K3** |
| CO4 | Infer altered physiology | **K4** |
| CO5 | Discriminate abnormal functioning of the organs from normal | **K5** |
| CO6 | Integrate each body system to homeostasis and feedback mechanism | **K6** |

**K1** - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6**– Create

**Unit I: Nutrition and Respiration (15 hours)**

Nutrients –Types, calorific values and daily requirements. Digestion and absorption of carbohydrates, proteins and lipids. Minerals and vitamins – their deficiency. Hormonal control of digestion; Standard, active and routine metabolism, balanced diet, BMR and BMI. Respiration - types, Respiratory pigments - structure of haemoglobin, Structure of mammalian lungs Transportation of gases - Bohr effect, respiratory quotient, Regulation of respiration, Bronchitis & asthma, Physiological effects of smoking.

**Unit II: Circulation, Excretion and Thermoregulation (15 hours)**

Blood - composition and functions, Mechanism of clotting, Types of hearts, Heartbeat, Pace maker, Cardiac cycle, ECG, Pulse & Blood pressure. Structure of human heart and its working mechanism. Structure of Kidney and Nephron, Mechanism of urine formation. Excretory products, Osmo-regulation in aquatic and terrestrial animals, Thermoregulation.

**Unit III: Muscle and Nerve physiology (15 hours)**

Types of muscles, Ultrastructure of striated muscle, Muscle contraction - physiology, theories and properties. Neurons -structure and types - Impulse propagation, synaptic transmission, neurotransmitters. Reflex action, Nerve disorders - epilepsy, Alzheimer's disease, Parkinson's disease.

**Unit IV: Sense organs** **(15 Hours)**

Structure of eye, physiology of vision, visual elements and pigments, photo chemistry of vision, Eye defects - myopia, hyperopia, presbyopia, astigmatism, cataract. Structure of ear and mechanism of hearing, hearing impairments - deafness, labyrinthine disease. Olfactory, gustatory and tactile sense organs.

**Unit V: Reproductive physiology and Endocrinology** **(15 Hours)**

Human - male and female reproductive organs. Endocrine glands in man - structure, hormones, action and disorders of pituitary, thyroid, parathyroid, adrenal gland, testis and ovary, Feedback mechanism, Hormonal control of the menstrual cycle. Mechanism of hormonal activity. Puberty, adolescence, pregnancy, parturition, lactation and birth control. Role of hormones in growth, metamorphosis and reproduction in arthropods.

**Textbooks:**


1. Rastogi, S.C. 2001. Essentials of Animal Physiology (III Ed.), New Age International Publication, New Delhi.
2. Verma, Tyagi and Agarwal, 2000. Animal Physiology. Chand and Company Ltd., New Delhi.
3. Goel K A; Sastri K V (2000) Text Book of Animal Physiology, Rastogi Publications.
4. Arumugam N; Mariakuttikan A 2017. Animal Physiology, Saras Publication
5. Jain AK Textbook of Physiology. Avichal Publishing Company


**Reference Books:**


1. Schmidt - Nielsen, K. 2002. Animal Physiology-Adaptation and Environment, Cambridge University Press, Cambridge.
2. William S. Hoar, 2004. General and Comparative Physiology, Third Edition, Prentice- Hall of India Private Limited, New Delhi.
3. Yapp W B, 2000. Introduction to Animal Physiology, International Development Research Centre.
4. Murkat,P.C.; Mathur, P.M.2000. Text Book of Animal Physiology, NIL.
5. Guyton AC, Hall JE, Text Book of Medical Physiology, Elsevier


**E-resources:**

1. https://library.viu.ca/c.php?g=189003&p=1247721
2. https://louis.oercommons.org/curated-collections/56
3. https://learninglink.oup.com/access/butler
4. https://bookeshi.com/best-physiology-free-online-resources-for-medical-students-2/

| Mapping with programme outcomes | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **COs** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** |
| **CO1** | L | L | M | L | L | M | L | S |
| **CO2** | M | M | M | L | L | M | L | S |
| **CO3** | S | S | M | M | L | S | M | S |
| **CO4** | S | S | M | M | L | M | S | S |
| **CO5** | S | S | M | S | L | M | S | S |
| **CO6** | S | S | S | S | L | M | S | S |

S- Strong, M- Medium, L- Low

## IMMUNOLOGY AND MICROBIOLOGY

(Subject code: 23UZOC62)

**Semester: VI Core:Theory 8 Credits: 4 Hours: 5**

**Objective:** To strengthen the knowledge on immune system, immune response, microbial diseases as well as to impart knowledge on microbiological applications; to introduce organs and cells of the immune system, and diversity of microorganisms; to know the cellular and molecular basis of immune response

**Course outcomes:**

| At the end of the course the students will be able to | | |
|---|---|---|
| CO1 | Describe organs and cells involved in immune system, its structure and functions | **K1** |
| CO2 | Explain taxonomy and diversity of microorganisms, and immune response and mechanisms | **K2** |
| CO3 | Examine the basic structure of microbes and their growth in relation to abiotic factors | **K3** |
| CO4 | Categorize microbial diseases, their causative agents, symptoms, curative and control methods | **K4** |
| CO5 | Handle, identify and assess growth characters of microbes | **K5** |
| CO6 | Prepare different microbial products of biological utilization | **K6** |

**K1** - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6**– Create

**Unit I: The Immune system (15 hours)**

Types of immunity - innate and adaptive, Lymphoid organs - primary and secondary; Cells of immune system - B and T cell, mast cells, dendritic cells, NK cells, Null cells, and Macrophages. Immune response, Immunoglobulin - structure and types, Basic concepts of MHC.Epitopes, Paratopes, Haptens and Adjuvants.

**Unit II: Immune Response and Reactions (15 hours)**

Antigen and Antibody interactions; T-cell activation, B-cell activation. Basic properties and functions of cytokines, interferons and complement proteins. Hypersensitivity - Types and Mechanisms. Immunity to infection (Antibacterial immunity and Antiviral immunity). Autoimmunity, Immunodeficiency.

**Unit III: Microbe classification (15 hours)**

Characters and basic classification of Kingdom Monera and Fungi. Scope of Microbiology. Systematic position of Virus - classification - structure of bacteriophage. Viroids and Prions. General structure of fungi. General structure (ultrastructure of *E. coli)*, classification and identification of bacteria.

**Unit IV: Bacterial culture and microbial diseases (15 hours)**

Sterilisation, Types of Culture medium, Culture of Bacteria, Bacterial growth and growth curve, Factors influencing bacterial growth. Maintenance & characteristics of colonies. Staining of bacteria, Pathogenecity, epidemiology, prevention and control of Bacterial (Cholera, Typhoid), Viral (Rabies, HIV) & Fungal (Candidiasis, Dandruff) diseases in man.

**Unit V: Applied immunology and microbiology (15 hours)**

Vaccines - types & Immunization - schedule, Monoclonal antibodies, Control of Microbes, Preservation of Milk - Microbes in food spoilage, Culture of yeast & economic importance. Microbial nitrogen fixation – stages, Types and methods of fermentation & products, Basic concepts of Probiotics, Bio-fermenters and its role in mass culture. *Bt*, NPV, Bacculoviruses in agriculture.

**Textbooks**


1. Abbas AK, Lichtman KH, Pillai S (2016). Basic Immunology: Functions and disorders of the immune system. 5th edition, Elsevier.
2. Ananthanarayan R, Jayaram Paniker CK (2016). Text book of Microbiology, 9th edition. Universities Press.
3. Dubey RC, Maheshwari DK (2010). A Textbook of Microbiology, S. Chand Publishers, New Delhi.
4. Mani A, Selvaraj AM, Narayanan LM, Arumugam A (2014). Microbiology, Saras Publication, Nagercoil.
5. Michael J Pelczar et al. (2000). Microbiology, 5th edition. Tata McGraw-Hill Pub. Co. Ltd


**Reference Books**


1. Joanne M. Willey, Linda Sherwood, Christopher J. Woolverton (2011). Prescott's Microbiology. Mc-Graw Hill.
2. Tortora G, Funke B, Case C, Weber D. (2018). Microbiology in Introduction, 13th edition. Addison-Wesley Publications.
3. Ryan KJ, Ray CG, (2018) editors. Sherris medical microbiology. 7th edition, McGraw-Hill Education.
4. Subhash Chandra Parija (2012). Textbook of Microbiology & Immunology, 2nd Edition, Elsevier India.


**E-resources**

1. http://www.helmberg.at/immunology.pdf
2. https://icuadelaide.com.au/files/primary/physiology/immunology.pdf
3. https://en.wikipedia.org/wiki/List_of_infectious_diseases
4. http://www2.sunysuffolk.edu/czuraa/BIO244LectureMaterials/BIO244Chapter18Slides.pdf

| Mapping with programme outcomes | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **COs** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** |
| **CO1** | L | L | M | L | L | M | L | S |
| **CO2** | M | M | M | L | L | M | L | S |
| **CO3** | S | S | M | M | L | S | M | S |
| **CO4** | S | S | M | M | L | M | S | S |
| **CO5** | S | S | M | S | L | M | S | S |
| **CO6** | S | S | S | S | L | M | S | S |

**1.** * S- Strong, M- Medium, L- Low

## ANIMAL PHYSIOLOGY – PRACTICALS

(Subject code: 23UZOC63)

**Semester: VI Core: Practical 7 Credits: 2 Hours: 2**

**Course Objectives:**

- Explain the gross morphology, structure and functions of various organs of the animal body.
- Identify different tissues and organs of different systems of animal body.
- Perform the haematological test like blood cell count, haemoglobin estimation, bleeding/clotting time, etc. in human
- Record the blood pressure, heart rate, pulse rate and respiratory volume in human

1. Rate of oxygen consumption of a freshwater fish
2. Salt loss and salt gain in freshwater fish
3. Effect of temperature on human salivary amylase activity
4. Identification of nitrogenous excretory products – ammonia, urea, uric acid
5. Estimation of Haemoglobin using haemoglobinometer
6. Measurement of blood pressure in Man – Demonstration
7. Preparation of haemin crystals in human/chick blood
8. BMI analysis using height and weight
9. Determination of blood clotting time
10. Qualitative analysis of protease, amylase and lipase in cockroach digestive system.
11. Effect of temperature on fish opercular movement

12. **Spotters**–Animal physiology: Human brain, heart, lungs, eye, tongue, ear, Pancreas, Human Kidney, Human circulatory system, digestive system, L.S. of testis and Ovary, Types of muscles, Endocrine glands (Pituitary gland, Thyroid gland, Parathyroid gland, Adrenal gland), ECG, Oxygen dissociation curve (Bohr effect), Menstrual cycle, and Gastrointestinal hormone.

## IMMUNOLOGY AND MICROBIOLOGY - PRACTICAL

(Subject code: 23UZOC64)

**Semester: VI Core: Practical 8 Credits: 2 Hours: 2**

- This course gives an overview of the immune system including organs, cells and receptors
- The students learn about the molecular basis of antigen recognition, hypersensitivity reaction, antigen-antibody reactions
- The course develops in the student an appreciation for the principles of immunology and its applications in treating human diseases. This fundamental paper discusses the importance of microorganisms

1.Human blood grouping (ABO and Rh factor).
2.WBC count in humanblood
3. Double diffusion / radial immunodiffusion.
4. Separating lymphocytes.
5. Haemagglutination test.
6. Demonstration of lymphoid organs of rat (preserved specimen)
7. Demonstration of ELISA
8. Isolation of microbes from animals by serial dilution technique
9. Gram staining technique
10. Acid fast technique
11. Motility test
12. Culture of microbes with Agar and PDA
13. Spore counting with Haemocytometer

**14.Spotters:** Colony appearance – *Streptococci*, *Vibrio cholerae*,*Clostridium tetanii*,Morphology of viral particles: T4 bacteriophage, HIV, Hepatitis – B, IgM, IgG, IgA, IgE and IgD, Macrophage, Bursa of Fabricius (book plates/images). Rat lymphoid organs (preserved specimens)

**Elective 3 - Group Project**
(Subject code: 23UZOC65)

| **Semester: VI** | **Project** | **Hours: 6** | **Credits: 3** |
|---|---|---|---|

Group projects can help students to develop skills specific to collaborative efforts, which pool knowledge of all individuals, are increasingly important in the professional world. Positive group experiences have been shown to contribute to student learning and retention and also to institutional growth.

Each group consists of 4 - 6 under-graduate students, based on number students in III B.Sc. class. Students will be selected by the staff members by lot system during the fifth semester. Topics are allotted depending on the interest of the group / research centres of the faculty. The tentative title of the group project is displayed in the department notice board at the beginning of the sixth semester.

Two continuous assessments will be done on 31$^{st}$ and 62$^{nd}$ day of the working day. In the first assessment, a review of literature (photo copies of the reprints), objectives, materials and methods and works carried out by the candidates should be submitted for evaluation. In the second assessment, results obtained up to the submission could be submitted along with first assessment materials. Marks for these internal assessments will be allotted by the guide. In the final (External) evaluation students are required to submit hard bound detailed project report in the form of dissertation. It will be evaluated by the guide and external examiner and the marks will be allotted based on dissertation and *viva voce* thereof.

**ENTOMOLOGY**

(Subject code: 23UZOE61)

**Semester: VI Elective:Theory6 Credits: 2 Hours: 4**

**Objective:** To study the elements of insect diversity and structure; as well as to understand the insect pests of cultivable crops and their management; to Illustrate the utility value of various productive insects, biological control agents, and other beneficial insects; to classify pestiferous insects on locally cultivable plants; to summarize pests of stored products; to develop management strategies for insect pests and vectors.

**Course Outcomes:** At the end of the course the students will be able to

| At the end of the course the students will be able to | | |
|---|---|---|
| CO1 | Recognize and identify different insect Orders. | **K1** |
| CO2 | Compare the structure and salient features of insect Orders | **K2** |
| CO3 | Acquire the knowledge of correct identification of an unknown insect up to the family level. | **K3** |
| CO4 | Acquainted with various insect-pests of field crops their damage symptoms and learn the techniques of pest management. | **K4** |
| CO5 | Examine different vectors of plant pathogens, their characteristics and the process of transmission of plant viruses and fungal pathogens. The students will also learn about the management techniques of different vectors.. | **K5** |
| CO6 | Strategize techniques to manage different type of insect pests and the damage caused by them | **K6** |

**K1** - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6**– Create

**Unit I. Structure and Salient features** **(12 Hours)**

Insect classification and their distinctive characters; Morphological features of head, thorax and abdomen; Salient features of insect orders - Orthoptera, Isoptera, Hemiptera, Diptera, Coleoptera, Lepidoptera, Dermaptera, Odonata, Neuroptera and Hymenoptera

**Unit II: Productive and Beneficial insects** **(12 Hours)**

Bionomics and economic importance of Silkworms, Honeybee and Lac insects; Brief account on biological control agents - Lacewings, ladybird beetles, Trichogramma; Pollinators, weed killers, scavengers, insect as food and feed.

**Unit III: Field crop and Horticultural Crop Pests** **(12 Hours)**

Bionomics, damage, symptoms and management of two major pests of rice (*Scirpophagaincertulas and Cnaphalocrocis mainsails)*sugarcane (*Chilo infuscatellus and Aleurolobusbarodensis*) groundnut (*Amsactaalbistriga and Aproaeremamodicella)*, cotton (*Helicoverpaarmiger*a and *Aphis gossypii*), coconut (*Oryctes rhinoceros and Rhynchophorusferrugineus)*, brinjal (*Leucinodesorbonalis*and*Henosepilachnavigintioctopunctata*, tomato (*Bemisiatabaci and Tuta absoluta*) and banana(*Cosmopolites sordidus and Odoiporuslongicollis* )

**Unit IV: Pests of stored products, Domestic pests and insect vectors (12 Hours)**
Bioecology, damage caused and management of *Callosobruchus chinensis, Sitophilus oryzae* and *Triboliumcastaneum*; Medical importance and management of *Pediculus humanus capitis, Pediculus humanus corporis, Anopheles, Culex, Aedes, Xenopsyllacheopis.*

**Unit V. Pest management concept, components and methods (12 Hours)**
Infestations – sucking, defoliators, borers; Economic Injury Level; Pest Management decision making; Brief account on physical, chemical, cultural, biological, genetic control of pests, IPM (general account only), Bt cotton -concepts and application.

**Textbooks:**


1. David, B.V. and Ananthakrishnan, T.N. 2004. General and Applied Entomology. Tata-McGraw Hill Publishing Company, New Delhi.
2. Kalyanasundaram, S. and Kalyanasundaram, M. 2003. Pest management in field Crops / Horticultural Crops. Keran Desk Top Publisher, Vellore.
3. Ambrose, D. P. 2015. The Insects - Structure, Function and Biodiversity, Kalyani Publishers, Ludhiana.
4. D.B. Tembhare2021. Modern Entomology, Himalaya Publishing House Pvt. Ltd, Mumbai
5. Mike W. Service. 2004. Medical entomology for students. Third Edition. Cambridge University Press, USA.


| Mapping with programme outcomes | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **COs** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** |
| **CO1** | S | L | M | S | S | S | L | S |
| **CO2** | M | M | M | S | S | M | L | S |
| **CO3** | S | S | M | M | S | S | M | S |
| **CO4** | S | S | M | M | L | M | S | M |
| **CO5** | S | S | M | S | S | S | S | M |
| **CO6** | S | S | S | S | L | M | S | M |

* S- Strong, M- Medium, L- Low

## BASIC ENTOMOLOGY – PRACTICAL

(Subject code: 23UZOE62)

**Semester: VI Elective: Practical 6 Credits: 1 Hours:2**

1. Insect collection devices and preservation methods
2. Representative insects from various insect orders
3. Cockroach: Mounting of antennae, mouthparts, spiracles
4. Housefly: Mounting of mouthparts, halter, wing
5. Honeybee (preserved slide): mouthparts, legs, and sting
6. Mosquito (preserved slide): life stages, mouthparts, wings
7. Submission of representative harmful insects from different orders
8. Mini-projects
   - 8.1.Human vectors [mosquitoes, bed bugs, louse, cockroaches] –photos or paper cutting with notes.
   - 8.2.Life cycle, nature of damage, control measures of cotton, paddy, coconut, brinjal, lady's finger pests
9. Spotters: Insect pests (maximum of 6); Types of head, antennae, mouth parts, legs, wings
10. Field trip and inclusion of report in the record notebook – Agro-ecosystems / Agriculture College /Research institutes (compulsory)

## ZOOLOGY FOR COMPETITIVE EXAMINATIONS

(Subject code: 23UZOS61)

**Semester: VI SEC 4 Credits: 2 Hours: 4**

**Objective:** To revise the fundamentals of various branches of Zoology and to prepare for competitive exams for higher education and employment.

**Course Outcomes:** At the end of the course the students will be able to

| At the end of the course the students will be able to | | |
|---|---|---|
| CO1 | Recognize and identify different animals. | **K1** |
| CO2 | Compare and distinguish salient features of animals. | **K2** |
| CO3 | Acquire the knowledge of different organ systems | **K3** |
| CO4 | Acquainted with various genetic and microbiology techniques. | **K4** |
| CO5 | Examine different aspects of developmental stages and levels of evolution in animal husbandry | **K5** |
| CO6 | Develop and implement new technologies in animal husbandry | **K6** |

**Unit I: Animal diversity and classification (12 Hours)**

Concepts of biological classification, hierarchy, nomenclature, General classification and salient features : Invertebrates – ten Major phyla (Protozoa – Echinodermata) Prochordates (pro, meso and urochordates) Vertebrates – five classes (Fishes –Mammals)

**Unit II: Physiology, Cell biology and Biochemistry (12 Hours)**

Human physiology –General account on digestion, respiration, circulation, excretion, skin, eye, ear, brain and nervous system, endocrine and exocrine glands and skeletal system.

Cell and cell organelles – plasma membrane, Golgi complex, Endoplasmic reticulum, lysosome, mitochondria, ribosome, nucleus, nucleolus and centriole.

Small molecules and biological importance of carbohydrates, amino acids, proteins, lipids, nucleic acids and vitamins.

**Unit III: Genetics, Genetic Engineering, Microbiology and Immunology (12 Hours)**

General account on Mendelian concepts, Gene mutation, chromosomal aberration, inborn errors of metabolisms, genetic disorders, Eugenics, Euthenics and Euphenics. Genetic engineering

Microscopy– microscope types, general account on bacteria. Communicable diseases of human beings

Lymphoid organs, Innate and Acquired immunity, active and passive immunity

**Unit IV : Developmental Biology, Evolution and Environmental Biotechnology**

**(12 Hours)**

Gametogenesis and organogenesis. Patterns of evolution; Geological time scale and mile stones of human evolution.

Types of ecosystems, pollution control – sewage treatment, solid waste management – xenobiotics, heavy metals and hydrocarbon; biomagnification and bioleaching. Global warming and climate change.

**Unit V : Application biology** **(12 Hours)**

Marine and freshwater aquaculture: fin fish and shell fish culture Sericulture, apiculture, lac culture, poultry, dairy, piggery, and leather industry

**Textbooks**


1. Saxena, O.P. (1998). Objective Zoology, Prakashan Publishers, Meerut.
2. Zoology Question Bank, Dept of Zoology, St. Xavier's College, Palayamkottai


**Reference Books**


1. Kohli, K.S. and KavitaSahni (2010). Animal Diversity and Evolution, Ramesh Book Depot, Jaipur.
2. Singh, B.K. (2004). Biodiversity conservation and management, Mandal Deep Publications, Jaipur.
3. Jordan, E.L. and Verma P.L (2003) - Invertebrate Zoology. Chand & Company Ltd. Ramnagar, New Delhi.
4. Jordan. E.L. and Verma P.S. (2004) - Chordate Zoology, Chand and Company Ltd. New Delhi.

**Add on Courses**
**SERICULTURE**
(Subject Code: 23UZOAO1)

**AOC: 1** **Credits: 2** **Hours: 30**

Course in-charge : **Dr. R. Azhaguraj & Dr. R.Santhakumari**

**Course objectives:**

To create awareness of the economic importance and status of silkworm industry and develop skills in mulberry cultivation and silkworm rearing techniques; to expose to available schemes, projects and programmes. We are promoting sericulture as a self-employment venture.

**Course Outcomes:**

| At the end of the course the students will be able to | | |
|---|---|---|
| CO1 | Gain knowledge on rearing of silk worm. | **K1** |
| CO2 | Describe the cultural practices and pest management in mulberry garden. | **K2** |
| CO3 | Apply rearing techniques and use of appliances | **K3** |
| CO4 | Recommend treatments for infestation with natural enemies and diseases. | **K4** |
| CO5 | Evaluate quality parameters, economics and marketing of silk. | **K5** |
| CO6 | Build a cottage industry as well as generate an employment opportunity | **K6** |

**K1** - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6**– Create

**Unit I: Introduction** **(6 Hours)**

Silk producing organism - Silkworm (Tasar, Muga, Eri, Anaphe, Gonometa, Fagara, Coan), Uses of silk, History of sericulture, Silk production in the world, Sericulture in India, The Central Silk Board, Research Institutes, Future scope.

**Unit II: Moriculture** **(6 Hours)**

Conditions for mulberry growth, Classification of mulberry, Planting systems, Methods of propagation, Methods of irrigation, Manuring - organic and chemical, Types of pruning, Methods of harvesting. Leaf-eating pests & control measures.

**Unit III: Silkworm** **(6 Hours)**

*Bombyx mori* - Taxonomy, Life cycle, Races (indigenous and commercial), Morphology (structure of egg, larva, pupa & adult), Silk gland, Pests of silkworm (Uzi fly, Dermestid beetle), Silkworm diseases - causative agent, symptoms and their management (Pebrine, Flacherie, Grasserie& White muscardine).

**Unit IV: Rearing facilities and operations** **(6 Hours)**

Procedures in grainages, Rearing house, Rearing appliances, Feeding appliances, Mountage - types, Disinfection (physical and chemical methods), Brushing, Mounting - methods, Rearing methods for young worms and mature larvae.

**Unit V: Marketing** **(6 Hours)**

Commercial characters of cocoon, Defective cocoons. Silk reeling steps - Stifling, Storage, Sorting, Riddling, Blending, Cooking, Brushing, Reeling appliances. Raw silk testing, By-products of sericulture.

**Textbooks**

1. Ganga G, Sulochana Chetty J (2008). An introduction to sericulture (2nd edition), Oxford and IBH Publishing House, New Delhi.
2. Ullal S.R. and Narasimhanna, M.N. Handbook of Practical Sericulture: CSB, Bangalore.

**Reference books:**

1. David, B.V. and Ramamoorthy, V.V. 2011. Elements of economic entomology. NP Namrutha Publications, Chennai.
2. Sengupta, K. A. 1989. Guide for Bivoltine Sericulture; Director, CSR & TI, Mysore.

**E- resources**

- http://csb.gov.in/assets/Uploads/documents/note-on-sericulture-2016-17.pdf
- http://csb.gov.in/publications/annual-report/
- https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4909305/#!po=1.90840
- https://www.india.gov.in/topics/agriculture/sericulture
- https://silks.csb.gov.in/

| Mapping with programme outcomes | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **COs** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** |
| **CO1** | L | M | M | L | L | M | L | M |
| **CO2** | M | M | M | L | L | M | M | M |
| **CO3** | M | M | M | L | L | M | M | M |
| **CO4** | S | M | S | M | S | S | M | M |
| **CO5** | S | S | S | M | S | S | S | M |
| **CO6** | S | S | S | M | S | S | S | M |

* S- Strong, M- Medium, L- Low

**ORNAMENTAL FISH CULTURE**
**(23UZOAO2)**

**Add on Course : 2** **Credits: 4** **Hours : 30**

Course in-charge : **Dr.T. Elizabeth and Dr. P. Raja**

**Course Outcomes:** At the end of the course the students will be able to

| At the end of the course the students will be able to | | |
|---|---|---|
| CO1 | Understand the modern techniques and methods of fishery industries | **K1** |
| CO2 | Recollect the basic knowledge about important Ornamental fishes | **K2** |
| CO3 | Classify aquarium plants and determining ornamental fish breeding which is highly professional | **K3** |
| CO4 | Categorize commercially important edible fishes | **K4** |
| CO5 | Validating the importance supplementary fish feeds and Artificial feed preparation. | **K5** |
| CO6 | Develop integrated methods to combat diseases and trade ornamental fish. | **K6** |

**K1** - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6**– Create

**Unit 1: Aquarium** **(6 hours)**

Construction of ornamental fish unit. Aquarium accessories - Aerators, filters and lighting; Design, construction, setting and maintenance of fresh water aquarium; Selection of ornamental fishes, maintenance and management of home aquarium.

**Unit 2: Identification of common ornamental fishes** **(6 hours)**

General account of common ornamental fishes, fighting fish, Gold fish, koicarp, Gourami, Rosy barbs ,Tetras (Widow tetra, Jewel tetra, Buenos aires tetra, Neon tetra), Angel fish, Red tailed black shark, Bridle shark, cichlids (Oscar, firemouth, zebra, blue morph and Ram cichlid), Live bearer (Moontail molly, sailfin molly, black molly, guppy, platy, redswordtail)

**Unit 3: Aquarium plants and Induced breeding** **(6 hours)**

Importance and Management of common Aquarium plants; General account of Breeding in aquarium fishes ; Induced breeding – Hypophysation,

**Unit4: Food and Feeding** **(6 hours)**

General account on live feed organism (Rotifers, Copepods, Cladocerans, Brine shrimp, Blood worm, Tubifex) and Artificial feeds. Methods of fish feeding, balanced diets for aquarium fishes

**Unit 5: Disease management and Economics** **(6 hours)**

General account of common parasitic (argulus, lernaea, nematodes), bacterial, viral, fungal diseases of ornamental fishes; Economics of ornamental fish culture and trading.

**Text Book:**

1. Jameson, J.D. and Santhanam. R. 1996, Manual of ornamental fishes and farming, Technologies Peejay, Thoothukkudi.

2. Arumugam, N.2010. Home aquarium , Saras publications.
3. Santhanam R, Sukumaran N(2000) , Manuel of fresh water aquaculture .
4. Srivastava CBL, (2000) Text book of Fishery science and Indian fisheries. Kilab mahal.

**Reference Books:**

1. Rath, R.K. 2000. Freshwater Aquaculture. Scientific Publishers (India). PO Box: 91, Jodhpur.
2. Mohan Kumar. C. 2008. Handbook on ornamental fish diseases, MPEDA , India
3. Arumugam, N. 2010, Home Aquarium, Saras Publication
4. H.S. Jagtap, S.N. Mukherjee and V.K. Garad, 2018. A Textbook of Pisciculture and Aquarium Keeping, Daya Book Publications, 2018, eighth Edition, PP. 264.

**E-Resources**

1. https://www.researchgate.net/publication/282759544_Ornamental_Fish-culture_Technologies
2. http://cifa.nic.in/sites/default/files/ORNAMENTAL%20FISH%20CULTURE_0.pdf
3. http://www.ccari.res.in/TB%20No.16.pdf
4. http://www.aces.edu/dept/fisheries/education/documents/Species_Module_Ornamental_Tropical.pdf

| Mapping with programme outcomes | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **COs** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** |
| **CO1** | S | S | S | S | S | S | S | S |
| **CO2** | S | S | S | S | S | M | M | S |
| **CO3** | S | S | S | M | S | S | M | S |
| **CO4** | S | S | S | M | L | M | S | S |
| **CO5** | S | S | S | S | L | S | S | S |
| **CO6** | S | S | S | S | L | M | S | M |

* S- Strong, M- Medium, L- Low

**BASICS OF ORNITHOLOGY**
**(23UZOAO3)**

**Add-on: 3** **Credits: 2** **Hours: 30**

**Staff in-charge: Dr. J. Ronald**

**Course outcomes:**

| At the end of the course the students will be able to | | |
|---|---|---|
| CO1 | Recall the taxonomic position of birds, and avian diseases | **K1** |
| CO2 | Describe the external and internal structures of the bird and different types of bird behaviour | **K2** |
| CO3 | Differentiate birds based on their morphology, foraging strategies and other behaviour | **K3** |
| CO4 | Analyse how birds evolved, bird adaptations to flight, and threats to birds | **K4** |
| CO5 | Criticize case studies related to bird conservation | **K5** |
| CO6 | Modify and develop the role of citizen science in ornithology | **K6** |

**K1** - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6**– Create

**Unit I : Basic concepts and bird diversity** **(6 Hours)**

Introduction to Ornithology; Bird Lore; Birds and Humans; Classification of Birds, Bird Evolution and Speciation; Endemism

**Unit II: Bird structure and adaptations** **(6 Hours)**

External Morphology of the Bird; Structure of bird feather, Internal Structure of the Bird; Adaptations to Flight

**Unit III: Bird behaviour** **(6 Hours)**

Bird Behaviour: Foraging, Roosting, Vocalization, Imprinting, Feather care, Bird Intelligence, Social Behaviour, Mixed Species Flocks, Migration

**Unit IV: Bird biology** **(6 Hours)**

Breeding Biology: Differential investment of sexes; territoriality, courtship and display behaviour, nesting, eggs, incubation and care of young, brood parasitism

**Unit V: Bird research and conservation** **(6 Hours)**

Studying bird populations and communities, sampling methods; Macro ecology; Molecular Techniques in Ornithology; Avian Disease; Citizen Science and Ornithology; Threats faced by birds; Bird Conservation with case studies

**Reference books:**


1. Field Guide Salim Ali, BNHS
2. John W. Fitzpatrick, Irby J. Lovette (2016). Handbook of Bird Biology, 3rd ed. Wiley.
3. Tim Birkhead (2013). Bird Sense: What it's like to be a bird? Bloomsbury, NY.
4. Bob Montgomerie, Jo Wimpenny, Tim Birkhead (2014). Ten Thousand Birds: Ornithology since Darwin. Princeton University Press, Princeton, NJ.
5. Frank B. Gill, Richard O. Prum, Scott K. Robinson (2019). Ornithology, 4th ed. Macmillan.

| Mapping with programme outcomes | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **COs** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** |
| **CO1** | L | L | L | L | L | L | M | M |
| **CO2** | L | L | L | L | L | L | M | M |
| **CO3** | M | M | M | M | M | L | S | S |
| **CO4** | M | S | M | M | S | S | S | S |
| **CO5** | S | S | S | S | S | S | S | S |
| **CO6** | S | S | S | S | S | S | S | S |

(S-Strong; M-Medium; L-Low)

## BASICS OF MEDICAL CODING

(Subject Code: 23UZOVA1)

**Value Added Course: 1** **Credits: 2** **Hours: 30**

Course in-charge : **Dr. S. Mabel Parimala andDr. R. Azhaguraj**

**Course outcomes:**

| At the end of the course the students will be able to | | |
|---|---|---|
| CO1 | Gain knowledge on the basics and importance of medical coding. | **K1** |
| CO2 | Describe medical terms related to human anatomy and pathophysiology. | **K2** |
| CO3 | Document medical records in the prescribed formats | **K3** |
| CO4 | Analyse diseases or symptoms and assign codes for quick and efficient healthcare procedures. | **K4** |
| CO5 | Improve patient outcomes, increasing accuracy in diagnosis and streamlining work associated with healthcare. | **K5** |
| CO6 | Translate physician's reports into medical codes for accurate medical billing. | **K6** |

**K1** - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6**– Create

**Unit I: Introduction to medical coding** **(6 Hours)**

Medical billing vs. Medical coding – Scope of medical coding – Tasks and responsibilities of a medical coder – Essential steps to become a medical coder – Factors for successful medical coding – Career routes open to medical coders – Prominent medical coding certifications & its importance – AAPC and AHIMA certification process.

**Unit II: Codes and process in medical coding** **(6 Hours)**

Methods of converting medical services into codes – Significance of medical coding in healthcare business – Stakeholders in medical coding procedure – Common medical codes: ICD, CPT, HCPCS, NDC, DRG, HCC & Revenue codes – Modifier codes – Steps to construct error-free medical claim – Process for handling contractual issues and appeals.

**Unit III: Healthcare terminology** **(6 Hours)**

Healthcare terms: Decodable terms, Non-decodable terms and Eponyms –Spelling rules – Overall structure of ICD-10-PCS – Suffixes (noun-ending, adjective, pathology, procedure, instrument) – Prefixes – Singular / Plural rules. Organization of human body – Surface anatomy terms – Positional & Directional terms – Body cavities – Body regions – Body planes.

**Unit IV: Human body systems - I** **(6 Hours)**

Functions, Anatomy and Physiology, Pathology, Procedures & Abbreviations: Musculoskeletal system(bones, joints, ligaments, muscles, tendons) – Integumentary system – Digestive system – Urinary system – Male Reproductive system – Female Reproductive system.

**Unit V: Human body systems – II** **(6 Hours)**

Functions, Anatomy and Physiology, Pathology, Procedures & Abbreviations: Blood and immune system – Circulatory system – Respiratory system – Nervous system – Eye – Ear – Endocrine system.

**Text books:**

1. Victoria M Brent. Medical Billing & Coding for Beginners: The Most Complete Guide to Mastering Your Skills and Boost Your Earnings Potential.
2. Betsy J. Shiland. Medical Terminology & Anatomy for ICD-10 Coding. Elsevier Inc., US.

**Reference books:**

1. Carol J. Buck, Jackie L. Grass. Step-by-Step Medical Coding. Elsevier Publisher.
2. Sandra L. Johnson, Robin Linker. Understanding Medical Coding – A Comprehensive Guide. Cengage Learning, Massachusetts, United States.
3. Logan Taylor. Medical Billing and Coding for Beginners 2023: The Ultimate Guide to Start Successful Career in Medical Billing and Coding to Secure a Bright Financial Future.
4. Samuel Corington. Medical Billing and Coding for Beginners.

| Mapping with programme outcomes | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **COs** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** |
| **CO1** | L | L | L | L | L | L | M | M |
| **CO2** | L | L | L | L | L | L | M | M |
| **CO3** | M | M | M | M | M | L | S | S |
| **CO4** | M | S | M | M | S | S | S | S |
| **CO5** | S | S | S | S | S | S | S | S |
| **CO6** | S | S | S | S | S | S | S | S |

(S-Strong; M-Medium; L-Low)

**MEDICAL LABORATORY TECHNOLOGY**
(Subject Code: 23UZOVA2)

**Semester II** **VAC: 2** **Credits: 2** **Hours: 30**

Course- Coordinator: **Dr. S. Mabel Parimala and Dr. R. Azhaguraj**

**Course objective:** To equip with theoretical and practical knowledge in various diagnostic tests in order to work in a variety of laboratory settings including hospitals, research facilities and industrial laboratories.

**Course outcomes:**

| At the end of the course the students will be able to | | |
|---|---|---|
| CO1 | Learn safety concerns and good practices of a laboratory. | **K1** |
| CO2 | Acquire knowledge on the routine test methodologies for detecting ailments. | **K2** |
| CO3 | Handle and process specimens procedurally. | **K3** |
| CO4 | Examine and report basic screening tests for disease identification. | **K4** |
| CO5 | Evaluate bodily functions, such as the kidney, liver, or thyroid function. | **K5** |
| CO6 | Monitor treatment or disease progression. | **K6** |

**K1** - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6**– Create

**Unit I: Introduction** **(6 Hours)**

Clinical Laboratories: Organization, Ethics and Laboratory Medicine, Automation. Laboratory Safety and First Aid: Laboratory Safety Policies, Biohazard and Safety Precautions, Radiation Hazard, Fire Hazard, Personal Safety, First Aid Kits and Procedures. Basic Lab Operations: Units of measurements, Preparation of Reagents. Good Laboratory Practices.

**Unit II: Haematology** **(6 Hours)**

Collection and Processing of Blood Specimen, Preparation of Blood Films. Routine Haematological Tests: Determination of Haemoglobin concentration, Haematocrit, Red Blood Cell Indices, ESR, Enumeration of Formed Elements, Microscopic study of Blood Smear, Reticulocyte Count, Absolute Platelet Count. Basic Screening Tests for Bleeding Disorders.

**Unit III: Microbiology, Virology and Parasitology** **(6 Hours)**

Rules of Microbiology Laboratory, Basic Lab Procedures in Microbiology, Quick Reference of Media and Biochemical Tests. Diagnosis of Viral Infections: Direct Examination, Serological Testing, Limitations of Serological Diagnosis. Identifying Characteristics: Pathogenic Bacteria, Pathogenic Fungi and Helminths.

**Unit IV: Clinical Pathology** **(6 Hours)**

Urine Analysis: Clinical Significance, Laboratory Diagnosis of Renal Function, Routine Examination of Urine. Examination of Body Fluids: Cerebrospinal Fluid, Serous Fluids, Synovial Fluid, Vaginal Discharge, Gastric Juice. Semen Analysis: Laboratory Investigation, Forensic Investigation. Stool Examination: Routine Laboratory Analysis.

**Unit V: Clinical Biochemistry and Histology** **(6 Hours)**

Specimens of Biochemistry and their Handling, Types of Specimens, Automation. Routine Biochemical Test Procedures: Blood Glucose, Serum Protein, BUN, Uric Acid, Creatinine, Bilirubin, Thyroid Function Tests. Biochemical Test Profiles. Techniques in Histology: Laboratory Equipment, Tissue Preparation and Processing, Routine Staining Procedure.

**Text books:**


1. Kanai L. Mukherjee, Anuradha Chakravarthy. Medical Laboratory Technology – Procedure Manual for Routine Diagnostic Tests. Volumes: I, II and III. CBS Publishers and Distributors Pvt. Ltd., New Delhi.
2. A. V. Naigaonkar, M. D. Burande. A Manual of Medical Laboratory Technology. Nirali Prakashan Publishers, Pune.
3. R. P. Jayaswal. Basics of Medical Laboratory Science. Notion Press Publishers, Chennai.


**Reference books:**


1. Manual of Laboratory Techniques for District Public Health Laboratories. National Institute of Communicable Diseases, Govt. of India, New Delhi.
2. Arvind H. Patel. A Manual of Medical Laboratory Technology. Authorhouse Publisher, Indiana, United States.
3. Stanley S. Raphael. Lynch's Medical Laboratory Technology. Saunders Publisher, London, United Kingdom.
4. Frances T. Fischbach, Margaret A. Fischbach. Fischbach's – A Manual of Laboratory and Diagnostic Tests. Lippincott Williams and Wilkins Publisher, Pennsylvania, United States.


| Mapping with programme outcomes | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **COs** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** |
| **CO1** | L | L | L | L | L | L | M | M |
| **CO2** | L | L | L | L | L | L | M | M |
| **CO3** | M | M | M | M | M | L | S | S |
| **CO4** | M | S | M | M | S | S | S | S |
| **CO5** | S | S | S | S | S | S | S | S |
| **CO6** | S | S | S | S | S | S | S | S |

(S-Strong; M-Medium; L-Low)

**Extra Credit Courses**
**Poultry Farming**
(Subject Code: 23UZOEC1)

**Semester: I ECC: 1 Credits: 2 Hours: 30**

**Course coordinator : Dr. T. ElizabethThangamani Sunitha**

**Course Outcomes:** At the end of the course the students will be able to

1. Highlight the common breeds of poultry, body systems, breeding systems involved in poultry farming, Culling and judging of poultry.
2. Explain the status advantages perspective of Indian poultry industry of rearing poultry.
3. Examine the principles of poultry housing, housing environment and housing management. Housing for chicks, growers, layers and broilers.
4. Analyze the basic principles of nutrition, kinds of feeds and their role on the growth and reproduction
5. Evaluate poultry diseases, preventive and control measures.
6. Formulate high quality balanced diet

**Unit I – Introduction**
Farming poultry, poultry registration, Breed selection for farming, Poultry in Namakkal, Marketing, and Economics of poultry.

**Unit II – Poultry farming**
Different Types of Poultry Farming Systems – Backyard, commercial, breeder, mixed farming; Choosing commercial layers and broilers; Practical aspects of chick rearing; External and Internal body parts.

**Unit III – Poultry Nutrition and feeding**
Poultry diets in general, Energy and nutrients for poultry, various poultry diets, Major ingredients for poultry diets, Feeding appliances and programs.

**Unit III – Poultry Management**
Management of eggs, chick, beak trimming, breeders, brooders, growers, layers, broilers

**Unit V – Poultry Diseases**
Viral (Ranikhet diseases, Fowl pox), Bacterial (Salmonellosis, Mycoplasmosis, Tuberculosis); fungal (Aspergillosis and Aflatocicosis), Miscellaneous diseases; Principle of immunity, immunization and control of infectious diseases.

**Text Books**


1. Jadav, N.V. 2010.Handbook of Poultry Production and Management, Second edition, Jaypee Brothers Medical Publishers Private Limited, PP. 410.
2. Sreenivasaiah, P.V. 2015. Text book of Poultry Science, Write and Print Publication, First Edition, PP. 720
3. Sushil Prasad. 2011. Handbook Of Poultry Production: A Practical Guide, Enkay Publishing House, PP. 248.

**E- resources**

1. https://www.daera-ni.gov.uk/articles/introduction-poultry-and-eggs-farming
2. http://www.fao.org/ag/againfo/themes/en/poultry/AP_management.html
3. http://agritech.tnau.ac.in/animal_husbandry/ani_chik_poultry%20mgt.html
4. http://www.ag.auburn.edu/~chibale/an12poultryfeeding.pdf

**HUMAN ANATOMY**

(Subject Code: 23UZOEC2)

**Semester: II ECC: 2 Credits:2 Hours:30**

**Course coordinator :Dr. R. SanthaKumari**

**Course Outcomes:** At the end of the course the students will be able to

1. Describe the morphology and functional anatomy of the human body
2. Explain the normal structure and function of the human body
3. Demonstrate the implications of disruption of normal structure and function.
4. Select medical or health-related careers.
5. Summarize the common diseases.
6. Developing strategy to cope with disorders.

**Unit I : Introduction to Human Anatomy**

Human Anatomy Human beings-*Homo sapiens sapiens* Features- Morphological features (Definition, types of Anatomy (microscopic and Gross ), levels of organizations; vital properties of living beings.), Definition and significance of Vestigial organs.

**Unit II :Skeletal and Muscular systems**

Integumentary, Skeletal, Muscular systems – locations, organ basic structure and functions; their related common diseases.

**Unit III: Neuro and Cardiovascular systems**

Nervous, Endocrine, Cardiovascular—locations, organ basic structure and functions; their related common diseases.

**Unit IV: Respiratory, digestive and Lymphatic systems**

Lymphatic, Respiratory, Digestive—locations, basic structure and functions; their related common diseases.

**Unit V: Urinogenital organ systems**

Urinary, male Reproductive-, female Reproductive- -– locations, basic structure and functions; their related common diseases.

**TEXT BOOK:**


1. T.S. Ranganathan, A text book of Human Anatomy.
2. Ester.M. Greishcimer. Physiology and anatomy with Practical Considerations. J.P. LippinCott, Philadelphia.
3. Willam Davis. Understanding Human Anatomy and Physiology, MC Graw Hill. Willam's( Pter, L) Gray's Anatomy, 38lfl eds. Churchill Livingstone, 1995.
4. Fahana, Human Anatomy (Descriptive and Applied) Saunder;s& Co., Prism Publishers, Bangalore.


**E-resources**

1. http://www.medicalcity-iq.net/medlib/Anatomy%20of%20the%20human%20Body.pdf

## ANIMAL BEHAVIOUR

(Subject Code: 23UZOEC3)

**Semester: III ECC: 3 Credits:2 Hours:30**

**Course coordinator: Dr. J. Babila Jasmine**

**Objective:** To understand the basic concepts of animal social and reproductive behaviours and their function related environment.

**Course Outcomes:** At the end of the course the students will be able to

1. List the general and innate behavior of animals
2. Comprehend the ecological aspects of behaviour
3. Predict the social behaviour
4. Classify the reproductive behaviour
5. Summarize biological rhythms and memory
6. Integrate the role of environment on behavior

**Unit I: General and innate behaviour**

Definitions of ethology and animal psychology - ethogram; classification of behavioural patterns - neural and hormonal control of behaviour - communication - genetic and environmental components in the development of behaviour.

**Unit II: Ecological aspects of behaviour**

Habitat and food selection -optimal foraging theories- aggression - homing - territoriality - dispersal- host parasite relationship.

**Unit III: Social behaviour**

Aggregation - schooling in fishes -flocking in birds -herding in mammals - group selection - kin selection - altruism - inclusive fitness - forms of social organization (insects and primates).

**Unit IV: Reproductive behaviour**

Reproductive strategies - mating systems - mate choice - sex differences - courtship - sexual selection - parental care in vertebrates - allomothering.

**Unit V: Biological rhythms, learning and memory**

Circadian and circannual migration of fishes and birds; conditioning, habituation - insight learning - association learning - reasoning - cognitive skills.

**Text Books:**


1. McFarland 1985. Animal behaviour, ECBS Longman, Essex.
2. Manning and M. S. Dawkins 1998. An Introduction to Animal Behaviour, Cambridge University Press, Foundation Books, New Delhi.
3. Alcock, J.2006. Animal Behaviour, Sinauer Associates, INC, Sunderland, Massachusetts

**Reference Books:**


1.Alcock J. 2013. Animal Behaviour, Sinauer Associate Inc., USA

2. Verma P.S. and Agarwal V.K. 2000, Environmental Biology, S.Chand& Co, New Delhi.

3. Gunadevia H.S. & Hare Govinda Singh, Text book of Animal Behaviour (2000)

4.DrickamerLC ,Vessey SH . 2001. Animal Behaviour. McGraw-Hill

5.Dujatkin LA. 2014. Principles of Animal Behaviour. 3rd Edn. W.W.Norton and Co.


**E-Resources:**

1. https://www.ncbs.res.in/content/animal-behaviour
2. https://bit.ly/3i6wUxR
3. https://www.behaviour.univie.ac.at/

**BIODIVERSITY CONSERVATION**
**(Subject Code: 23UZOEC4)**

**Semester: IV ECC: 4 Credits:2 Hours: 30**

**Course coordinator : Dr.T. Pushpananthan**

**Objectives:** To educate the students about the importance of biodiversity, species concept, loss of animal diversity, direct implications for the management of species and ecosystems, captive breeding and reintroduction and habitat restoration

**Course Outcomes:** At the end of the course the students will be able to

1. Describe the concepts of Biodiversity and animal diversity
2. Differentiate the causes and effects of biodiversity
3. Determine the loss of animal diversity
4. Categorize animal laws and policies in India
5. Assess economics of biodiversity conservation and measure the status of species in the wild
6. Create awareness through the conservation tools and conservation education.

**Unit I: Biodiversity; species concepts; animal diversity**
Ecosystem, Genetic and Species diversity; Assigning values to biodiversity - Species concepts;GIS and remote sensing for diversity assessment; Biodiversity Hotspots -Western Ghats, Indo-Burma region; Biogeography of India.

**Unit II: Loss of animal diversity, status of species**
Concepts of Island biogeography and extinction rates on Islands - Human induced, Modern and local extinctions - Population reduction-threats to wildlife (examples). Threats to animal diversity in India; **Status of species -**Rare, endemic and threatened species; Measuring status of species in the wild - IUCN Red list.

**Unit III: Conservation tools**
*In situ* and *Ex situ* conservation; Captive breeding programme; People participation in conservation; Red listing process: categories and criteria; Wildlife conservation in India **-** importance of conservation - methods of wildlife conservation;

**Unit IV: Animal laws and policies in India; Economics of biodiversity conservation:**

Wildlife (Protection) Act of India (1972) - Protected Area network - forest policy - Prevention of cruelty to Animal Act - Convention on Biological diversity. Economics of biodiversity conservation; The world Conservation Unit (IUCN) - World wildlife fund (WWF) - Indian Board for Wildlife (IBWL).

**Unit V: Conservation education, awareness and implementations**
Role of NGO's and Government organizations in wildlife conservation.Wildlife / Animal magazines, Journals - Government organizations in wildlife conservation - Wildlife celebration days in India; Wildlife conservation in Tamil Nadu; National park and sanctuaries in Tamil Nadu.

**Textbooks**

1. M. P. Singh and Arvind Kumar. 2015. Biodiversity and Conservation, APH Publishing Corporation, New Delhi.
2. Janamjit Singh, 2006. Biodiversity: Planning For Sustainable Development, Deep & Deep Publications Pvt Ltd, New Delhi.

**Reference Books**

1. Prabodh K. Maiti and PaulamiMaiti, 2011. Biodiversity: Perception, Peril and Preservation, Prentice-Hall of India Pvt.Ltd, New Delhi.
2. Gabriel Melchias,2001. Biodiversity and Conservation, Oxford & IBH Publishing Company, Delhi**.**
3. B. K. Singh,2004. Biodiversity: Conservation and Management, Mangal Deep Publications, Jaipur, Rajasthan.
4. Krishnamurthy K.V, 2009. An Advanced Textbook on Biodiversity Principles and Practice, Oxford & IBH Publishing Co Pvt.Ltd,New Delhi, India

**E-resources**

1. https://www.conserve-energy-future.com/biodiversity-conservation-types-importance-methods.php
2. https://www.environmentalpollution.in/essay/biodiversity-types-importance-and-conservation-methods-with-diagram/311
3. http://www.businessandbiodiversity.org/the_issues_conserve.html
4. https://vikaspedia.in/energy/environment/biodiversity-1/conservation-of-biodiversity
5. https://www.worldwildlife.org/pages/what-is-biodiversity
6. https://www.biodiversitya-z.org/

## PHARMACOLOGY

(Subject Code: 23UZOEC5)

**Semester: V ECC: 5 Credits:2 Hours:30**

**Course coordinator: Dr. S. Mabel Parimala**

**Objective:** To provide necessary information on the properties, dose, effects, metabolism and benefits of drugs.

**Course Outcomes:** At the end of the course the students will be able to

1. Define therapeutic uses of the commonly available drugs for various ailments.
2. Discuss the impact of drugs on nervous system
3. Examine the impact of drugs on organs
4. Classify hormones and hormone antagonists
5. Choose appropriate chemotherapy
6. Design protocol for drug development.

**Unit I: General Pharmacology**

Definition, categories of drugs, routes of drug administration; absorption, distribution and excretion of drugs; factors modifying drug effects.

**Unit II: Drugs acting on nervous system**

Hypnotics and sedatives, anti-convulsants, analgesic-antipyretics, antidepressants, local anaesthetics, cholinergic and adrenergic drugs and their side effects.

**Unit III: Drugs acting on organs**

Gastrointestinal - appetizers, emetics, antiulcer drugs; Respiratory organ -bronchial asthma, expectorants, antitussives; Heart -anti-arrhythmic, anti-hypertensive agents; and their side effects.

**Unit IV: Hormones and hormone antagonists**

Adrenocortical steroids, androgen and anabolic steroids, estrogens and progestins, thyroid and antithyroid drugs, oral antidiabetic drugs and their side effects.

**Unit V: Chemotherapy**

Synthetic antimicrobial agents; Common Antibiotics-penicillins, cephalosporins, tetracyclins; Chemotherapy of urinary tract infections, malaria, typhoid, tuberculosis, amoebiasis; Diabetics and hypoglycaemic drugs, Disinfectants and antiseptics.

**Text Books:**


1. Murugesh N., 2004. A Concise Textbook of Pharmacology. Sathya Publishers.
2. Tripathi K..., 2000. Essentials of Medical Pharmacology. Jaypee Brothers.


**Reference Books:**


1. Panda, U.N., 2005. Handbook of Pharmacology. AITBS Publishers.
2. Uma, Bhandari, 2012. A Textbook of Pharmacology. Biotech Pharma Publications.
3. Das, 2001. Pharmacology. Books and Allied Pvt. Ltd.
4. Chunawalla, S.A., 1998. Essentials of Pharmacology. Himalaya Publishing House.

5. Budhiraja, R.D., 1993. Elementary Pharmacology and Toxicology. Popular Prakashan.

**E-resources:**

1. https://www.dphu.org/uploads/attachements/books/books_734_0.pdf
2. https://www.intechopen.com/books/basic-pharmacokinetic-concepts-and-some-clinical-applications/drug-distribution-and-drug-elimination
3. https://www.drugs.com/drug-class/central-nervous-system-agents.html#:~:text=There%20are%20many%20different%20types,and%20NSAIDs)%2C%20and%20sedatives.
4. https://www.healthline.com/health/urinary-tract-infection-adults#risks-for-women
5. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4034109/
6. https://www.healthline.com/health/anabolic-steroids

**ETHNOMEDICINE**
**(Subject Code:23UZOEC6)**

**Semester: VI ECC: 6 Credits:2 Hours: 30**

**Course coordinator : Dr.R. Azhagu Raj**

**Objective:**
To provide basic information on the therapeutic species and their uses in traditional medicine and conservation.

**Course Outcomes:** At the end of the course the students will be able to
1. Describe the basics of Ethnotaxonomy.
2. Learn the importance of therapeutic animals in traditional medicine
3. Examine the role of animals in ecological diversity
4. Categorize about the Ethnozoological practices in tribes.
5. Summarize the importance and conservation of animals
6. Generate awareness on ethno-medicine

**Unit I: Ethnotaxonomyand Zootherapy**
Introduction to Ethnotaxonomy; Ethnozoology -Traditional medicine; Tribes-Ethnic Groups and Indigenous people, Sacred Grooves and Sacred groove animals; Zootherapy; Zootherapeutic species in India.

**Unit II: Ethnomedicine**
Folk medicine- Healers, local healer, Traditional healers, Bhopa; Method of preparation of ethnomedicine, Route of administration.

**Unit III: Ethnozoological Practices**
Animal byproducts from Arthropods and Molluscs, Ethno-entomological practices (mites, spiders and insects); Medical importance of Honey bee and its venom; Leech therapy; Ethnozoological practices in tribes in South Asian countries.

**Unit IV: Ethnonutrition and medicine**
Nutritional importance of animals and their products- Magico religious purpose, rituals, taboos and cultural practices; Thanatophobia; Role of animals and their parts in Siddha, Ayuervedha, Unani and Chinese medicine; Common herbals/metals/salts used in ethnozoology.

**Unit V: Conservation of Traditional Knowledge and Systems.**
Ethnozoology in India and other Countries, Conservation of ancient knowledge system- Traditional knowledge system- Indigenous knowledge system, local ecological knowledge, Conservation of therapeutic animals.

**REFERENCE**

1. Ethnobiology in India, A Status Report. 2014. AICRPE. Ministry of Environment and Forests, Govt. of India, New Delhi.
2. Balakrishnan, M.

## ALLOTMENT OF MARKS

**CIA – 1 conductedfor 50 marks**
**CIA – 2 conducted for 50 marks**
**Cumulative marks of CIA -1 and 2 will be converted to 70 marks**
**Assignment – 15 marks**
***Viva voce* – 15 marks**
**Aggregate marks = 100**

### Theory Question Pattern for CIA and Semester Examination

| Examination type | Section A (1 mark) | Section B (2 marks) | Section C (5 marks) | Section D (15 marks) | Total |
|---|---|---|---|---|---|
| | No choice | No choice | Either or | Open Choice | |
| Internal | 5 x 1 = 5 | 5 x 2 = 10 | 5 x 1 = 5 | 2 x 15 = 30 | 50 |
| External | 20 x 1 = 20 | 5 x 2 = 10 | 5 x 5 = 25 | 3 x 15 = 45 | 100 |

**Note:** The Internal and External marks will be computed for 50 for each paper and the consolidation of these Internal and External marks will be for 100.

### Question Pattern and Marks for Practical examination

| Type of questions | Marks |
|---|---|
| Major Practical<br>1. Dissection, display, flag labeling /Procedure-5;<br>2. Performance of the experiment/observation, calculation and table or graph- (10 B.Sc) | 15 |
| Minor Practical / Instrumentation<br>Performance of the experiment/observation, calculation and table or graph- (10 B.Sc) | 10 |
| Identification of animals / instruments / spotters (5 or 10) | 5 |
| Spotters (5 x 3) -Identification – ½ mark, Diagram – ½ mark, Labeling – ½ mark; Unlabelled diagram carries no mark, explanation - 1½ mark | 15 |
| Record note book | 5 |
| Total | 50 |

**ANIMAL STRUCTURE AND FUNCTION**
**(Subject Code: 23UZOE31)**

**Semester: III Allied: Theory 1 Credit: 4 Hours: 4**

**Objectives:** To provide basic and advanced knowledge of animals on taxonomy, morphology and physiology of animals

**Course Outcomes:**At the end of the course the students will be able to

1. Identify and classify animals
2. Distinguish the structural organization of an invertebrate from a vertebrate
3. Examine the process of digestion, respiration and excretion in humans
4. Illustrate circulatory and nervous system of human body
5. Summarize the role of hormones in reproduction.
6. Integrate animal structure with its functions.

**Unit I: Invertebrata ( 12 Hours)**

Salient features of invertebrates, classification up to phyla with diagnostic features and examples. Type study: Cockroach

**Unit II: Chordata ( 12 Hours)**

Classification up to classes of Vertebrata with diagnostic features and examples; Type study: Frog – External morphology, digestion, respiration and circulation, reproductive systems

**Unit III: Digestion, Respiration and Excretion in man ( 12 Hours)**

Digestion – structure of alimentary canal, Physiology of digestion and absorption; Respiration – structure of lungs, respiratory pigments, transport of oxygen and carbon dioxide, respiratory quotient; Excretion - structure of kidney and nephron, mechanism of urine formation.

**Unit IV: Circulation, Nervous system and Receptors in man ( 12 Hours)**

Circulation – structure of heart, composition and functions of human blood, cardiac cycle, blood pressure; Nervous system - structure of neuron, nerve impulse conduction, reflex action; Receptors - Structure of eye and physiology of vision.

**Unit V: Endocrine Glands and Reproductive System ( 12 Hours)**

Structure and hormones of endocrine glands - Pituitary, thyroid, adrenal, islets of Langerhans; Human reproductive system, female reproductive cycle, contraceptives.

**Text books:**


1. Jordan, E.L., Verma, P.S. 2012. Invertebrate Zoology, S. Chand and Company.
2. Verma, Tyagi, Agarwal, 1997. Animal Physiology, S. Chand and Company.
3. Ayyar, E. 2009. A manual of Zoology, Volume 11, S. Visvanathan P Ltd., Chennai.


**Reference books:**


1. EkambaranathaAyyar M., Ananthakrishnan, T.N. 1995. A Manual of Zoology, Vol. I (Invertebrata) Part I & II. Viswanathan Pvt. Ltd.
2. Kotpal, R.L. 2000. Invertebrates, Rastogi Publications.
3. Rastogi, S.C. 2001. Essentials of Animal Physiology, New Age International Publications.

**E-resources:**

1. https://www.pmfias.com/classification-animalia-animal-kingdom/
2. http://www.biologydiscussion.com/invertebrate-zoology/21-general-characteristics-of-invertebrates/28088
3. http://biology.tutorvista.com/organism/vertebrates.html
4. http://www.arvindguptatoys.com/arvindgupta/human-body-systems.pdf
5. https://www.wsfcs.k12.nc.us/cms/lib/NC01001395/Centricity/Domain/8472/Body%20Systems%20Interactions%20chart.pdf
6. http://www.cabrillo.edu/~jtice/HSERV%20162/FUNCTIONALOrganization%20of%20the%20Human%20Body.pdf
7. http://samples.jbpub.com/9781449652609/99069_ch05_6101.pdf
8. https://www.saylor.org/site/wp-content/uploads/2010/11/The-Endocrine-System.pdf
9. https://www.scarsdaleschools.k12.ny.us/cms/lib5/NY01001205/Centricity/Domain/214/BRGT0390.pdf

**ANIMAL STRUCTURE AND FUNCTION - PRACTICALS**
**(Subject Code:23UZOE32)**

**Semester: III** **Allied: 1** **Credit: 1** **Hours: 30**

**Course outcomes:**

- It covers the connection between structure and function at the organ- and organism level.
- Animal physiology will explain how the organs work together to ensure survival of the animal and to enable the animal to adapt to different environments.
- The course will provide current physiological knowledge of general physiological principles, organ physiology and regulatory mechanisms and key physiological mechanisms involved in animal adaptations to different environments.
- The animal groups covered will range from invertebrates to vertebrates and the habitats discussed will include aquatic, terrestrial and aerial.
- In addition to the lectures, the student will also participate in laboratory practicals that involve animal physiology experiments.
- These practicals will be related to the information in the lectures and will help the students to understand the important concepts.

1. Virtual dissection of cockroach (Digestive system, Nervous system and Reproductive system).
2. Mounting of Cockroach, mosquito, houseful mouthparts
3. Mounting of prawn appendages
4. Collection, isolation of soil nematodes
5. Virtual dissection of frog (Digestive system, Nervous system and Reproductive system).
6. Effect of temperature on salivary amylase activity.
7. Qualitative estimation of excretory products.
8. Observation of cellular constituents of human blood.
9. Quantitative Estimation of haemoglobin using haemoglobin meter.
10. Demonstration of blood pressure.
11. Slide mounted specimens: *Paramecium, Leucosolenia*
12. Preserved specimens: *Hydra, Taeniasolium, Ascaris, Megascolex, Palaemon, Pila globosa, Asterias, Amphioxus, Balanoglossus, Ascidian,Anguilla, Rhacophorous, Chamaeleon, Najanaja*, Pelican, Parrot, Rabbit, Bat, *Manis* (pangolin),
13. 3-D Models: Human system / organs: – digestive system, lungs, kidney, nephron, heart, neuron, eye, thyroid.

## IMMUNOLOGY AND ANIMAL BIOTECHNOLOGY

(Sub code: 23UZOE41)

**Semester: IV Allied : Theory 2 Credits: 4 Hours: 3**

**Objective:** To inculcate the fundamental aspects of the immune system, antigen antibody reaction as well as techniques involved in animal cell culture and gene manipulation.

**Course Outcomes:** At the end of the course the students will be able to

1. Describe the concepts, components and principles of immune system
2. Explain primary and secondary lymphoid organs
3. Demonstrate antigen and antibody interactions and their techniques
4. Classify hypersensitivity and autoimmune disorders
5. Summarize animal cell culture techniques.
6. Design techniques in gene manipulation

**Unit I: Immune system (12 Hrs)**

Concepts, components and principles of innate and adaptive immune systems; Haematopoiesis; Cells of immune system - B cells, T cells and macrophages; Primary and secondary lymphoid organs.

**Unit II: Antigen and Antibodies (12 Hrs)**

Antigens – properties, types and determinants; Antibody (Immunoglobulin) – classes, structure, mechanism of action, functions; Monoclonal and polyclonal antibodies; ELISA and RIA techniques and their applications.

**Unit III: Immuno-prophylaxis, Hypersensitivity and Autoimmunity (12 Hrs)**

Vaccines – definite, types, mechanism of action, immunization schedule; Hypersensitivity - Definition, types, treatment of type I anaphylactic hypersensitivity; Autoimmunity – classification, disorders and therapy.

**Unit IV: Animal cells culture (12 Hrs)**

Characteristic features of animal cells in growth; Requirement - culture media, Equipments; Isolation of animal tissue- physical and chemical methods; Establishment of cell culture - primary, secondary cell culture and cell lines; Organ and embryo culture.

**Unit V: Technique of gene manipulation in animals (12 Hrs)**

Strategies of r-DNA technology; DNA finger printing ;Gene transfer methods; Cloning methods-Dolly; Transgenic animals; causes of infertility in male and female *; in vitro* fertilization (IVF) and embryo transfer.

**Text Books:**


1. Chakravarthy Ashik, K. 1996. Immunology – Tata Mc Graw-Hill Publishing Company Ltd., New Delhi.
2. Purohit, S. S. 2000. Biotechnology Fundamentals and Applications, Agrobios, Jodhpur, India Roitt I.M. 2000. Essential Immunology. Blackwell Scientific Publishers, London.

**Reference Books:**


1. Kuby, J. 1999. Immunology W.H. Freeman and Company, New York.
2. Roitt, Brostoff and Male, 1993. Immnunology, Mosby, London.
3. Gupta, P. K. 1999. Elements in biotechnology, Rastogi Publication, Meerut, India.


**E-resources**

1. https://microbiologyinfo.com/antigen-properties-types-and-determinants-of-antigenicity/
2. http://www.kean.edu/~jfasick/docs/Fall%2009%20&%20SP10%20%20A&PII/Chapter%2021b.pdf
3. http://jeeves.mmg.uci.edu/immunology/CoreNotes/Chap04.pdf
4. http://cdrwww.who.int/immunization/documents/Elsevier_Vaccine_immunology.pdf
5. http://www.lab.anhb.uwa.edu.au/hb313/main_pages/timetable/lectures/2007%20Tissue%20Culture%20Lecture%202%20combinedBjanka.pdf

## IMMUNOLOGY AND ANIMAL BIOTECHNOLOGY - PRACTICAL

(Sub. Code: 23UZOE42)

**Semester: IV Allied: 4 Credit: 1 Hours: 2**

**Course outcomes:**

- This course gives an overview on the immune system including organs, cells and receptors
- The students learns about the molecular basis of antigen recognition, hypersensitivity reaction, antigen-antibody reactions
- The course develops in the student an appreciation for the principles of immunology and its applications in treating human diseases
- Students learn about the transgenic animal, their application in the pharmaceutical industry, cloning and its importance.
- This course prepares the students to appreciate its benefits and applications in the biotechnological, pharmaceutical, medical and agricultural field

1. ABO Blood grouping and Rh factor.
2. WBC count in humanblood
3. Double immunodiffusion technique
4. Radial immuno diffusion
5. Separation of lymphocytes
6. Haemagglutination test
7. Cell viability test
8. Blood coagulation/ Clotting time
9. Rat lymphoid organs
10. Extraction of protein from animal tissue
11. Extraction of genomic DNA from human blood
12. Tissue culture media preparation
13. Spotters: Immunoglobulins, Thymus, Bone marrow, Lymphnode, Macrophage, Spleen, Bursa of fabricious, Antigen and antibody reaction,Engineered vaccine, Transgenic mice, Animal cloning – Dolly, Monoclonal antibodies, Cell growth curve, Embryo culture –*invitro* fertilization.