SATPUDA EDUCATION SOCIETY, JALGAON (JAMOD)'S

ARTS AND COMMERCE COLLEGE

Warvat Bakal Dist- Buldana

Dr. Rajendra S Korde
Incharge Principal

Shri. Krushnarao Ingle (Ex MLA)
President

Phone : 07266-237126 visit us at : www.acscwb.co.in Email : 327accwb@gmail.com

Criterion I: Curricular Aspects

1.3 Curriculum Enrichment

1.3.2 Number of courses that include experiential learning through project work / field work / internship during the year

Curriculum that includes Experiential Learning

Session-2021-2022

Supporting Document - A

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CERTIFICATE

This is to certify that the documents attached as supporting documents for Criterion I: Curricular Aspects are verified from the college record and found to be correct to the best of my knowledge.

Principal
Arts & Commerce College,
Warvat Bakal Dist.Buldana

Syllabus of the courses that include experiential learning through project work

Environmental Studies (B.A, B.com, B.sc. II)

%SANT GADGE BABA AMRAVATI UNIVERSITY, AMRAVATI
ORDINANCE NO. 42 OF 2005

Examination in Environmental Studies leading to Bachelor Degree, Ordinance, 2005

Whereas it is expedient to frame an Ordinance relating to Examination in Environmental Studies leading to Bachelor Degree level, hereinafter appearing, the Management Council is hereby pleased to make the following Ordinance.

1. This Ordinance may be called "Examination in Environmental Studies leading to Bachelor Degree, Ordinance, 2005."
2. This Ordinance shall come into force from the Academic session 2005-06.
3. In this Ordinance and in other ordinances relating to the examination, unless there is anything repugnant in the subject or context :-
   - (i) "Academic session" means a session commencing on such date and ending with such date of the year following as may be appointed by the Management Council.
   - (ii) "Admission to an examination" means the issuance of an admission card to a candidate in token of his having complied with all the conditions laid down in the relevant ordinance, by a competant officer of the University.
   - (iii) "Applicant" means a person who has submitted an application to the University in the form prescribed for admission to an examination.
   - (iv) "Candidate" means a person who has been admitted to an examination by the University.
   - (v) "Regular Candidate" means an applicant who has applied for admission to a Univeristy examination through an affiliated college, Department or Institute in which he/she has prosecuting a regular course of study.
   - (vi) "Examinee" means a person who present himself/herself for an examination to which he/she has been admitted.
   - (vii) "Examination" means an examination prescribed by the University under the relevant Ordinance.
   - (viii) "External Candidate" means a candidate who is allowed to take a University examination in accordance with the provision of Original Ordinance No. 151.
   - (ix) "Non-Collegiate Candidate" means a candidate who is not a collegiate candidate.

% Amended by Ordinance No. 7 of 2006, and 10 of 2007.

   - (x) An "Ex-student" is a person who having once been admitted to an examination of this University, is again required to take the same examination by reason of his failure or absence thereat and shall include a student who may have joined a college, Department or Institute again in the same class.
   - (xi) "Bachelor Degree Examination" means a examination leading to Bachelor Degree of the University.
   - (xii) "Previous Year" means a year following by final year of Bachelor Degree.
4. Save as otherwise specifically provided, the conditions prescribed for admission to the examination under this Ordinance shall apply to all persons who wish to take the examination to the Degrees of the University mentioned in para 5 below.
5. The conditions prescribed for admission to examination under this Ordinance shall apply to following degrees of the University :-
   1) Bachelor of Arts
   2) Bachelor of Performing Arts
   3) Bachelor of Fine Arts
   4) Bachelor of Mass Communication
   5) Bachelor of Social Work
   6) Bachelor of Commerce
   7) Bachelor of Business Administration
   8) Bachelor of Science
   9) Bachelor of Computer Science
   10) Bachelor of Computer Applications
   11) Bachelor of Pharmacy
   12) Bachelor of Science (Home Science)
   13) Bachelor of Technology (Cosmetics)
   14) Bachelor of Engineering
   15) Bachelor of Engineering (Part Time) (Civil)
   16) Bachelor of Textile
   17) Bachelor of Technology (Chemical Technology)
   18) Bachelor of Technology (Chemical Engg.)
   19) Bachelor of Architecture, and
   20) Bachelor of Laws (Five Year Course)

6 i) Environmental Studies shall be a compulsory subject for a previous year examination of the following Bachelor Degrees of the University,

1) Bachelor of Arts

2) Bachelor of Performing Arts

3) Bachelor of Fine Arts

4) Bachelor of Mass Communication

5) Bachelor of Social Work

6) Bachelor of Commerce

7) Bachelor of Business Administration

8) Bachelor of Science

9) Bachelor of Computer Science

10) Bachelor of Computer Applications

11) Bachelor of Pharmacy

12) Bachelor of Science (Home Science)

13) Bachelor of Technology (Cosmetics)

14) Bachelor of Engineering (Part Time) (Civil)

ii) Environmental Studies shall be a compulsory subject for IIIrd & IVth Semester of the following Bachelor Degrees of the University,

1) Bachelor of Engineering

2) Bachelor of Textile

3) Bachelor of Technology (Chemical Technology)

4) Bachelor of Technology (Chemical Engineering)

5) Bachelor of Architecture, and

iii) Environmental Studies shall be a compulsory subject for Vth & VIth Semester of the Degree of Bachelor of Laws (Five Year Course)

iv) Students admitted to Second Year/Third Year/IVth Semester Vth Semester of various degree examination courses in different faculties n the academic session 2005-06 or thereafter shall have to appear for examination in the subject Environmental studies.

7. The main Examination leading to Environmental Studies shall be held in Summer and Supplementary examination in Winter every year, at such places and on such date as may be appointed by the Board of Examinations.
Explanation :- Examination shall be conducted on the basis of one common question paper for all Bachelor Degree examination courses irrespective of annual or semester pattern.

8. Scope of the subject for annual pattern examination and or semester pattern examination shall be as provided under the syllabus.

9. Common question paper for all courses covered under this Ordinance alongwith answer books shall be supplied by the University to the Colleges, Departments and Institutes for conducting the examination of the subject.

10. Valuation of the answer books relating to this subject shall be done at College/Department/Institution level only. Remuneration for valuation of answer books shall not be paid by the University.
Provided that prescribed evaluation fee for evaluation of each answer Book/s of an external examinee/s appeared from the examination centre shall be paid to each examination centre.

11. It shall be obligatory on the part of the College/Department/Institute to submit candidate wise following information to the University on or before the date as may be prescribed by the University :-

Sr. No.	Grade/Category	Marks secured
1.	"A"	- 60 and above
2.	"B"	- 45 to 59
3.	"C"	- 35 to 44
4.	"D"	- 25 to 34
5.	"Fail"	- 24 and below
6.	"Absent"	

12. For the purposes of teaching, learing and examination, the Committee consisting of three teachers shall be appointed by the Principal/ Head of the Department/Head of the Institution under his/her Chairmanship/ Chairpersonship. While appointing three teachers on the said committee, the Principal shall take care that the teachers to be appointed on the committee, if necessary, shall be from different faculty.

13. i) Duration of theory examination of this subject shall be three hour.
ii) For all Bachelor Degree examinations, common question paper of 100 marks shall be provided by the University.
iii) Distribution of these 100 marks shall be as follows :-

a) Part-A, Short Answer Pattern	-	25 Marks
b) Part-B, Essay type with inbuilt choice	-	50 Marks
c) Part-C, Essay on Field Work	-	25 Marks

27. ENVIRONMENTAL STUDIES

Total Marks : 100

PART-A

SHORT ANSWER PATTERN **25 Marks**

1. The Multidisciplinary nature of environmental studies

- Definition, scope and importance.
- Need for public awareness.

(2 lecture hours)

2. Social Issues and the Environment

- From Unsustainable to Sustainable development
- Urban problems related to energy
- Water conservation, rain water harvesting, watershed management
- Resettlement and rehabilitation of people; its problems and concerns. Case studies.
- Envionmental ethics : Issues and possible solutions.
- Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case studies.
- Wasteland reclamation.
- Consumerism and waste products.
- Environment Protection Act.
- Air (Prevention and Control of Pollution) Act.
- Water (Prevention and Control of Pollution) Act.
- Wildlife Protection Act.
- Forest Conservation Act.
- Issues involved in enforcement of environmental lesislation.
- Public awareness. (7 lecture hours)

3. Human Population and the Environment

- Population growth, variation among nations.
- Population explosion - Family Welfare Programme.
- Environment and human health.
- Human Rights.
- Value Education.
- HIV / AIDS.
- Women and Child Welfare.
- Role of Information Technology in Environment and human health.
- Case Studies. (6 lecture hours)

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PART-B

ESSAY TYPE WITH INBUILT CHOICE **50 Marks**

4. Natural resources :

- **Renewable and non-renewable resources :**
  - Natural resources and associated problems.
    - Forest resources : Use and over exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forests and tribal people.
    - Water resources : Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems.
    - Mineral resources : Use and exploitation, environmental effects of extracting and using mineral resources, case studies.
    - Food resources : World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer - pesticide problems, water logging, salinity, case studies.
    - Energy resources : Growing energy needs, renewable and non renewable energy sources, use of alternate energy sources, Case studies.
    - Land resources : Land as a resource, land degradation, man induced landslides, soil erosion and desertification.
  - Role of an individual in conservation of natural resources.
  - Equitable use of resources for sustainable lifestyles.

(8 lecture hours)

5. Ecosystems

- Concept of an ecosystem.
- Structure and function of an ecosystem.
- Producers, consumers and decomposers.
- Energy flow in the ecosystem.
- Ecological succession.
- Food chains, food webs and ecological pyramids.
- Introduction, types, characteristic features, structure and function of the following ecosystem :-
  - Forest ecosystem
  - Grassland ecosystem
  - Desert ecosystem
  - Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

(6 lecture hours)

6. Biodiversity and its conservation

- Introduction - Definition : genetic, species and ecosystem diversity.
- Biogeographical classification of India.
- Value of biodiversity : consumptive use, productive use, social, ethical, aesthetic and option values.
- Biodiversity at global, National and local levels.
- India as a mega-diversity nation.
- Hot-spots of biodiversity.
- Threats to biodiversity : habitat loss, poaching of wildlife, man-wildlife conflicts.
- Endangered and endemic species of India.
- Conservation of biodiversity : In-situ and Ex-situ conservation of biodiversity.

(8 lecture hours)

7. Environmental Pollution

- Definition
- Causes, effects and control measures of :-
  - Air pollution
  - Water pollution
  - Soil pollution
  - Marine pollution
  - Noise pollution
  - Thermal pollution
  - Nuclear hazards
- Solid Waste Management : Causes, effects and control measures of
- Role of an individual in prevention of pollution.
- Pollution case studies.
- Diaster management : floods, earthquake, cyclone and landslides.

(8 lecture hours)

PART-C

ESSAY ON FIELD WORK **25 Marks**

8. Field work

- Visit to a local area to document environmental assets - river / forest / grass land / hill / mountain
- Visit to a local polluted site - Urban / Rural / Industrial / Agricultural
- Study of common plants, insects, birds.
- Study of simple ecosystems - pond, river, hill slopes, etc.

(5 lecture hours)

(**Notes** : i) Contents of the syllabys mentioned under paras 1 to 8 shall be for teaching for the examination based on Annual Pattern.

ii) Contents of the syllabys mentioned under paras 1 to 4 shall be for teaching to the Semester commencing first, and

iii) Contents of the syllabys mentioned under paras 5 to 8 shall be for teaching to the Semester commencing later.

LIST OF REFERENCES :-

1) Agarwal, K.C., 2001, Environmental Biology, Nidi Publ. Ltd., Bikaner.
2) Bharucha Erach, The Biodiversity of India, Mapin Publishing Pvt. Ltd., Ahmedabad - 380 013, India, Email : mapin@icenet.net (**R**)
3) Brunner R.C., 1989, Hazardous Waste Incineration, McGraw Hill Inc. 480p.
4) Clark R.S., Marine Pollution, Clanderson Press Oxford (**TB**)
5) Cunningham, W.P.Cooper, T.H.Gorhani, E & Hepworth, M.T., 2001, Environmental Encyclopedia, Jaico Publ. House, Mumbai, 1196p.
6) De A.K., Environmental Chemistry, Wiley Eastern Ltd.
7) Down to Earth, Certre for Science and Environment (**R**)
8) Gleick, H.P. 1993, Water in Crisis, Pacific Institute for Studies in Dev., Environment & Security. Stockholm Env. Institute, Oxford Univ. Press. 473p.
9) Hawkins R.E., Encyclopedia of Indian Natural History, Bombay Natural Histroy Society, Mumbai (**R**)
10) Heywood, V.H. & Watson, R.T. 1995, Global Biodiversity Assessment, Ca mbridge Univ. Press 1140p
11) Jadhav, H & Bhosale, V.M. 1995, Environmental Protection and Laws, Himalaya Pub. House, Delhi. 284 p.
12) Mckinney, M.L. & Schoch, R.M. 1996, Environmental Science Systems & Solutions, Web Enhanced Edition. 639 p.
13) Mhaskar A.K., Matter Hazardous, Techno-Science Publications (**TB**)
14) Miller T.G. Jr., Environmental Science, Wadsworth Publishing Co. (**TB**)
15) Odum, E.P., 1971, Fundamentals of Ecology, W.B.Saunders Co., U.S.A., 574p.
16) Rao M.N. & Datta A.K.,1987, Waste Water Treatment, Oxford & IBH Publ. Co. Pvt. Ltd. 345 p.
17) Sharma B.K., 2001, Environmental Chemistry, Goel Publ. House, Meerut.
18) Survey of the Environment, The Hindu (**M**)
19) Townsend C., Harper J., and Michael Begon, Essentials of Ecology, Blackwell Science (**TB**)

B.Com. (E- Commerce)

Appendix - P

B.Com. III
Semester V
e–COMMERCE - I

Time : 3 Hours **Marks: 60**

Objective: The objective of the course is to familiarize the students with the essentials of internet based e-commerce and to make them comprehend its practical aspects as well as growth potential of e-commerce in India.

Unit I: Basics of e-commerce:

Meaning of e-commerce, Essential components of e-commerce, four basic models/ concepts of e-commerce, Operational scheme of e-commerce, Benefits of e-commerce, Limitations of e-commerce and e-commerce v/s traditional commerce

Unit II: e-commerce in India:

History of Internet, Initiation of internet in India, Growth of internet users in India, Current scenario of e-commerce in India, Government FDI policy about e-commerce in India, Future of e-commerce in India

Unit III: Retail e-commerce:

Concepts of Business to Consumer (B2C), Consumer to Business (C2B) and Consumer to Consumer (C2C) e-commerce, Consumerøs shopping procedure on internet, Disintermediation and re-intermediation in B2C, E-auction procedure and benefits

Unit IV: B2B e-commerce:

Meaning and characteristics of Business to Business (B2B) e-commerce, Key technologies for B2B e-commerce, E- Marketplace models of B2B- Supplier oriented marketplace, Buyer oriented marketplace and Intermediary oriented marketplace

Unit V: e- Payment and e- Banking:

Indian Payment Models, e-payments options: Electronic fund transfer (EFT), Credit cards and debit cards based payment, Use of mobile applications (apps) for e-payment, Meaning of electronic banking, online banking services, benefits of online banking, Future of online financial services in India

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Books Recommended

1. Agrawala Kamalesh N and Agrawal Deeksha :
   Bride to Online Storefront, Macmillon India, New Delhi.
2. Agarwala Kamalesh N. and Agrawal Deeksha:
   Business on the Net- Introduction toe- Commerce; Macmillon India, New Delhi
3. Agarwala Kamalesh N. and Agrawal Deeksha:
   Bulls, Bears and The Mouse-An Introduction to Online Stock Market Trading; Macmillillon India, New Delhi.
4. Tiwari Dr. Murli Dr.:
   Education and E-Governance; Macmillon India, New Delhi.
5. Afuah A.and Tucci C.:
   Internet Business Models and Strategies; Mc Graw Hill, New York.

Internal Assessment Scheme

1. Theory paper will carry 60 marks and internal assessment 40 marks
2. 40 % Marks will be based on continue evaluation of the student assignment, class test, seminar and web-site visit /Industrial visit and project report.
3. Student will have to work under the guidance of the teacher and submit project report before fifteen days of the commencement of the theory examination.

Appendix - AF

B.Com. III
Semester VI
e-COMMERCE- II

Time : 3 Hours **Marks: 60**

Objective: The objective of the course is to acquaint the students with the internet- based e-commerce business models, internet marketing and e-governance.

Unit I: Internet e-commerce Business Models:

Social media model, advertising model, retail model, hybrid model, merchant model, informational model, drop-shipping model and revenue model.

Unit II: B2C Internet Marketing

Meaning of online marketing or internet marketing, online marketing strategies, marketing channels, internet branding, online publishing and advertising.

Unit III: B2B Online Marketing

Use of internet based electronic data interchange (EDI), Benefits of online marketing in B2B e-commerce, procurement reengineering, just in time delivery, online marketing issues.

Unit IV: E-governance:

Meaning of e-governance and e-government, Objectives of E-governance, Private sector interface in E-Governance, Concepts of government to Business (G2B), Business to Government (B2G), Citizen to Government (C2G),

Unit V: E- Governance Models

Application of Internet EDI in E-governance, E-governance in India, E-Governance Models, Comparative Analysis Model, Wider Dissemination Model, Critical Flow Model, E-advocacy Model

Books Recommended

1. Agrawala Kamalesh N and Agrawal Deeksha :
   Bride to Online Storefront, Macmillon India, New Delhi.
2. Agarwala Kamalesh N. and Agrawal Deeksha:
   Business on the Net- Introduction to e- Commerce; Macmillon India, New Delhi
3. Agarwala Kamalesh N. and Agrawal Deeksha:
   Bulls, Bears and The Mouse-An Introduction to Online Stock Market Trading; Macmillillon India, New Delhi.
4. Tiwari Dr. Murli Dr.:
   Education and E-Governance; Macmillon India, New Delhi.
5. Afuah A.and Tucci C.:
   Internet Business Models and Strategies; Mc Graw Hill, New York.

Internal Assessment Scheme

1. Theory paper will carry 60 marks and internal assessment 40 marks
2. 40 % Marks will be based on continue evaluation of the student assignment, class test, seminar and web-site visit /Industrial visit and project report.
3. Student will have to work under the guidance of the teacher and submit project report before fifteen days of the commencement of the theory examination.

Botany

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13. BOTANY

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

1.	Paper – 1		Marks
	a. Theory	-	80
	b. Internal Assessment	-	20
2.	Practical	-	50
		Total	**150 Marks**

1S – BOTANY

Diversity & Applications of Microbes and Cryptogams

UNIT-I : Plant Diversity **(15)**

1.1 Cyanobacteria and its impact on origin of life
1.2 Introduction to Plant Kingdom: Cryptogams
1.3 Diversity of plants with respect to habitat, form, nutrition and ecological status
1.4 General Account of Viruses and structure of TMV and HIV
1.5 Bacteria: structure, Nutrition and reproduction
1.6 Role of microbes in Agriculture, Medicine and Industries

UNIT-II: Algae **(15)**

2.1. Classification according to F. E. Fritsch and G. M. Smith up to classes
2.2. General characters of algae with reference to Habitat, Thallus

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UNIT-III : Fungi **(15)**

3.1. Classification according to Ainsworth (1973)
3.2. General characteristics of following classes with special reference to examples mentioned –
3.2.1. Mastigomycotina : Albugo (Cystopus)
3.2.2. Ascomycotina : Aspergillus
3.2.3. Basidiomycotina : Puccinia graminis-tritici
3.2.4. Deuteromycotina : General characters
3.3 Lichen-Types & Economic importance

Unit-IV : Bryophyte **(15)**

4.1. Classification according to G. M. Smith
4.2. General characters, thallus organization and life cycle of–
1.2.1. Hepaticopsida – Marchantia
1.2.2. Bryopsida – Funaria
4.3. Evolution of sporophyte in bryophytes
4.4. Affinities of bryophytes with algae and pteridophytes
4.5. Brief Account on some Indian Bryologist.

Unit-V : Pteridophyte **(15)**

5.1. Pteridophytes as First Vascular Plants.
5.2. Classification according to G. M. Smith
5.3. General characters of the following classes with special reference to examples mentioned –
5.3.1. Sphenopsida – Equisetum
5.3.2. Filicopsida – Marsilea
5.4. Stele types in pteridophytes
5.5 Heterospory and Seed Habit in Pteridophytes

Unit-VI : Application of Microbes Cryptogams **(15)**

6.1. Economic Importance of Algae with special reference to Food, Industries, Agriculture and Harmful aspects
6.2. Mycorrhiza – Types and Application

(2) Study of Crustose, Fruticose & Foliose Lichen

(3) Study of symptoms of fungal, viral, bacterial and Mycoplasmal diseases

(4) Collection of fungal specimen & infected plant part from local region

(6) Demonstration of Mushroom Cultivation Technology

III. BRYOPHYTES

Study of external and anatomy features of vegetative and reproductive parts of following genera – Marchantia, Anthoceros, Funaria, Polytrichum and Sphagnum

IV. PTERIDOPHYTES

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

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

BOOKS RECOMMENDED

1. Dube, H. C. (1990). An Introduction to Fungi. Vikas Pub. House Ltd. New Delhi.
2. Gangulee, H. C. and Kar, A.K. (2001). College Botany Vol. II. Books and Allied Press Ltd. Kolkata.
3. Krushnamurthy, K. V. (2007). An advanced Text Book on Biodiversity: Principles and Practice. Oxford and IBH Publishing Kumar, H.D. (1988). Introductory Phycology. Affiliated East-West Pres Ltd. New Delhi.
4. Kumar, H. D. and Singh, H.N. (1976). A Text Book of Algae. Affili-

Alage, Vikas Publishing House (P.) Ltd. New Delhi.

10. Parihar, N.S. (1977). Biology and Morphology of Pteridophytes. Central Book Depot, Allahabad.
11. Parihar, N.S. (1984). An Introduction To Embryophyta Vol. I Bryophyta. Central Book Depot, Allahabad
12. Rashid, A. (1996). An Introduction To Bryophyta. Vikas Publishing House Ltd. New Delhi.
13. Saxena, A.K. and Sarbhai, R.M.(1992). A Text Book of Botany Vol.II Embryophyta. Ratan Prakashan Mandir, Agra.
14. Sharma, O.P. (1989). A Text Book of Fungi. Tata Mc Graw-hill Publishing Company Limited, New Delhi.
15. Sharma, O.P. (1990). A Text Book of Algae. Tata Mc Graw-hill Publishing Company Limited, New Delhi.
16. Smith, G.M. (1995). Cryptogamic Botany. Vol. II (Bryophytes and Pteridophytes). Mc Graw-Hill Book Company, New York and London.
17. Sporne, K.R. (1995). The Morphology of Pteridophyta. The Hutchinson University Library, London, U.K.
18. Varma, P. S. and Agrawal, V. K. (2000). Cell Biology, Genetics, Molecular Biology, Evolution and Ecology. S. Chand and Company (P.) Ltd. New Delhi.
19. Vashistha, B.R. (1997). Botany For Degree Students-Bryophyta. S. Chand and company (P.) Ltd. New Delhi.
20. Vashistha, P.C. (1984). Pteridophytes. S. Chand and company (P.) Ltd. New Delhi.
21. Sharma, P.D. (1998). The Fungi. Rastogi Publications, Merrut.
22. Smith, G.M. (1995). Cryptogamic Botany. Vol. I (Algae and Fungi). McGraw-Hill Book Company, New York and London.
23. Vashistha, B.R. (1995). Botany for Degree Students-Algae. S. Chand and Company (P.) Ltd. New Delhi.

7. BOTANY

3S- BOTANY

ANGIOSPERM SYSTEMATICS, ANATOMY & EMBRYOLOGY

UNIT I: Angiosperm Systematics and Biodiversity.

1.1 Angiosperms: Origin and Evolution **(Pteridospermean and Bennititalean Theory)**

1.2 Botanical Nomenclature: Principles of rules, Taxonomic Ranks, Type concept, Valid publication.

1.3 Herbarium – Concept & significance, Royal Botanical Garden, Kolkata.

1.4 Concept of biodiversity, Ex situ and In situ conservation

1.5 Concept & importance of Biodiversity.

UNIT II: Angiosperm Systematics

2.1 Systems of Classification: Bentham and Hooker's System, Engler and Prantle's system.

2.2 Systematic studies & economic importance of following Families

Dicotyledons (Polypetalae) : Malvaceae, Brassicaceae, Leguminosae, Apiaceae,

UNIT III: Angiosperm Systematics

3.1 Systematic studies & economic importance of following Families

Dicotyledons (Gamopetalae): Asteraceae, Asclepiadaceae, Apocynaceae, Solanaceae, Verbenaceae, Lamiaceae.

3.2 Dicotyledons (Monoclamydeae): Euphorbiaceae.

3.3 Monocotyledons: Liliaceae, Poaceae.

UNIT IV: Anatomy

4.1 Types of Tissues:

Meristematic – Types of meristems

Permanent – Simple and complex.

4.2 Characteristics of growth rings, Sapwood and heartwood.

4.3 Anatomy of root: Primary structure in dicot and monocot root, normal secondary growth in dicot root.

stem, normal secondary growth in dicot stem.

5.2 Anomalies in primary structure in *Boerhhavia* stem, secondary structure in *Bignonia* and *Dracaena* stem.

5.3 Leaf Anatomy: Internal structure in *Nerium* and *Maize* leaf.

UNIT VI : Embryology

5.1 Microsporangium, microsporogenesis, development of male gametophyte.

5.2 Megasporangium, types of ovules, megasporogenesis, development of female gametophyte (monosporic, Bisporic & tetrasporic).

5.3 Double fertilization and triple fusion.

5.4 Embryo – Classification of embryo.

5.5 Endosperm types & significance, Suspended animation

LABORATORY EXERCISES

1) Embryology of Angiosperms:
   i) Observation of wide range of flowers available in the locality and methods of their pollination.
   ii) Study through permanent slides of T.S. of anthers, microsporogenesis, L.S. of ovule, types of endosperms and embryo of Capsella .
   iii) Mounting of T.S. of anthers, Pollen grains and pollinia.
2) Anatomy of angiosperms : Preparation of double stained slides of root, stem and leaves of angiosperms mentioned in the syllabus.
3) Taxonomy : Description of ten plants belonging to different families in technical language and identifiction upto family level.
4) Long and short excursion is essential

Note : Field tour reports should be supported by exhaustive field notes and photographic representation of plant species studied

Brassiacaceae- *Brassica,* **Malvaceae**- *Hibiscus, Sida, Malvastrum,* **Fabaceae**- *Crotalaria, Indigifera, Tephrosia,* **Caesalpinoidae**- *Caesalpinea, Cassia,* **Mimosoidae**- *Prosopis, Acasia,* **Apiaceae**- *Corindrum,*

Apocynaceae- *Vinca, Thevetia,* **Asclepiadaceae**- *Cryptostegia,Calatropis,* **Solanaceae**- *Datura, Solanum, Withania,*

14. Sabisn, F.F. (2000) Remote Sensing Principles and Interpretations. W.H. Freeman and Company, USA.
15. Lilesand, T.M. and Kiefer, R.W.(2000) Remote Sensing and Image Interpretation. John Wiley and Sons Inc., New York.
16. Drury, S.A. (1997) Image Interpretaton in Geology. Chapman and Hall, London.
17. Todd, D.K. (1980) Ground Water Hydrology. John Wiley and Sons Inc. New York.
18. Karanth, K.R. (1989) Hydrogeology. Tata McGraw Hill Pub.Co.Ltd., New Delhi.
19. Nagabhushaniah, H.S. (2001) Groundwater in Hydrosphere (Groundwater Hydrology) CBS Publisher, New Delhi.
20. Karanth K.R. Groundwater, Assessment, Development and Management. Tata McGraw Hill Pub. Co. Ltd., New Delhi.
21. Raghunath : Ground Water Hydrology, New Age Publication, Pune

question covering all the syllabus of Semester-V (8 marks).

5S - BOTANY

PLANT PHYSIOLOGY AND ECOLOGY

Unit - I: Plant Water Relations

1.1 Importance of water to plant life. Imbibition , Diffusion,Osmosis, Plasmolysis.
1.2 Active and passive Absorption of water.
1.3 Ascent of sap - Root Pressure and Transpiration Pull Theory.
1.4 Transpiration - Types of transpiration, Stomatal movements, Mechanism of transpiration (Starch) sugar hypothesis), Significance. Antitranspirant, Guttation.
1.5 Mineral uptake - Active uptake - Career Concept, Passive up take - Ion Exchange.

Study of morphological and anatomical adaptations in xerophytes -*Asparagus, Nerium, Casuarina, Euphorbia, Cycas, Opuntia* (any two)

3. Study of community characterstics by quadrat method.
4. Determination of water holding capacity of different soils.
5. To determine the texture of different soils by sieve method.

Ecology: Minor experiment (Any Two)

1. To determine the porosity of soil.
2. To determine the transparency and temperature of water bodies.
3. Estimation of salinity of different water samples
4. Determination of pH of different soils and water samples by pH papers/ pH meter.
5. Study of meteorological instruments -Rain gauge, Hygrometer, Barometer

PRACTICAL EXAMINATION

Time: 4 Hours Marks: 50

Q. 1 -	Physiology- major experiment-.	15
Q. 2 -	Comment one Minor Physiology experiment-	5
Q. 3 -	Ecology major experiment.	10
Q. 4 -	Ecology minor experiment.	5
Q. 5 -	Viva – voce	5
Q.6 -	Class record.	5
Q. 7 -	Co-curricular Activity Report	5

Co-curricular Activity Report" which mean the report on the activity
Such as Study Tour, Industrial visit to Research Institute, Excursion Tour to be submitted by the students at the time of practical examination.

Books Recommended:

Plant Physiology and Ecology:

1. Curtis & Clark. : Introduction of Plant Physiology.
2. H.N.Shrivastav. : Plant Physiology
3. Devlin R.M. : Plant Physiology
4. Salisbury F.B and Ross C.W. (1992).: Plant physiology (Fourth Edition) Wadsworth Publishing Company, California,USA.
5. William G. Hopkins. (1995): Introduction to Plant Physiology, Published by – John Wiley and Sons, Inc.
6. V.Verma : Plant Physiology Verlag, New York.Vol. II.
7. Mayer & Anderson.: Plant Physiology.
8. Lincoln Taiz and Eduardo Zeiger (2003). Plant Physiology (3rd edition), Published by Panima Publishing Corporation
9. Galston, A. W. 1989: Life processes in plants. Scientific American Library, Springer
10. Jain V.K.: Fundamental of plant Physiology. S. Chand Publication New Delhi.
11. Kocchar P.C.: Text Book of Plant Physiology.
12. Mohr, H. and Schopfer, P. 1995 : Plant Physiology 4th : Edition, Wordsworth
13. Moore, T.C. 1974: Research Experiences in Plant Physiology. A Laboratory Manual.
14. Mr./Mrs.Pillei : Plant Physiology New York, U.S.A.
15. P.S.Gill: Plant Physiology, S.Chand & Co. New Delhi, Edition - Pradip's, Botany
16. Purekar and Singh: Plant Physiology,
17. R. G. S. Bidwell (revised edn.)-Plant Physiology
18. Verma S.K. and Verma Mohit (2007). A.Text Book of Plant Physiology, Biochemistry and Biotechnology, S. Chand Publications.
19. Dennis D.T., Turpin, D.H. Lefebvre D.D. and Layzell D.B. (eds) 1997. Plant Metabolism (Second Edition) Longman, Essex, England.
20. Galstone A.W. 1989. Life processes in Plants. Scientific American Library, Springer Verlag, New York, USA..
21. Moore T.C. 1989. Biochemistry and Physiology of Plant Hormones Springer – Verlag, New York,USA.
22. Singhal G.S., Renger G., Sopory, S.K. Irrgang K.D and Govindjee 1999. Concept in Photobiology; Photosynthesis and Photomorphogenesis. Narosa Publishing House, New Delhi
23. Verma S.K. and Mohit Verma 2007. A.T.B of Plant Physiology, Biochemistry and Biotechnology, S. Chand Publications.
24. Ambasht. R.S. 1988.0 A Text Book of Plant Ecology Students FriendsCo.Varanasi.
25. Sharma P. D. 2003. Ecology and environment. Rastogi publication.
26. Botkin, D.B. and Keller, E.A. 2000. Environmental Plane (2nd edition).John Wiley & Sons Inc. New York.
27. Chapman. J.L. and Reiss. M.J. 1995. Ecology: Principles and ApplicationsCambridge University Press. College Publishers, USA.

Zoology

IS-ZOOLOGY

LIFE AND DIVERSITY OF NON-CHORDATA

UNIT-I :
1. Classification of Non-Chordata.
2. Phylum Protozoa: General characters.
3. Type study: Plasmodium vivax: Structure, Life-cycle.
4. Parasitic protozoan and human diseases': Malaria, Amoebiasis, Trypanosomiasis, Leishmaniasis .

UNIT-II :
1. Phylum Porifera: General Characters.
2. Type study: Scypha: Habits and habitat, External features, cell types, spicules & Structure and significances of canal system.
3. Phylum Coelenterata: General Characters,
4. Type study: Metridium: Habits and habitat, External features, Gastro-vascular cavity, Mesenteries, Reproduction.

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

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

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

physiological
4. Larval forms and their significance: Amphiblastula, Planula, Trochophore, Bipinnaria, Brachiolaria,

LIFE AND DIVERSITY OF NON-CHORDATA

Practical : Two practical per week each of 3 period's duration. The Examination shall be of 4 hrs duration and of 50 marks.

I-Life and diversity of non-chordata

1. Observation, Classification up to classes and sketching of the following animals, (Specimens or Models):
   - Phylum Protozoa: *Plasmodium* trophozoite, *Euglena, Entamoeba histolytica.*
   - Phylum Porifera: Sycon, Bath sponge, *Euplectella.*
   - Phylum Coelenterata: *Obelia, Aurelia, Tubipora.*
   - Phylum Helminthes: *Taenia, Ascaris* (male & female).
   - Phylum Annelida: Nereis, Earthworm, Leech,
   - Phylum Arthropoda: Prawn, *Limulus, Aranea, Scolopendra, Julus,* Moth, Mosquito.
   - Phylum Mollusca: Chiton, Pila, Dentalium, Unio, Octopus.
   - Phylum Echinodermata: *Antedon, Holothuria, , Echinus,* Sea star, Brittle star
   - Phylum Hemichordata: *Balanoglossus*
2. Study of Permanent slides:
   L.S.Sycon, nematocyst, Ascaris egg, T.S. Ascaris through gonads, T.S.Leech through crop, Compound eye of insect, Radula, Gill lamila and Osphradium of *Pila*, Scolex and Gravid Proglottid of *Taenia*.
3. Anatomical Study through Computer Aided Techniques, Video Clipping Models, Photographs and other available resources :
   a) Leech/Earthworm: Alimentary canal, Reproductive system, Nervous system,

Distribution of Marks during Practical Examination: Time : 4 hrs.

i)	Identification and comments on spots (1-8) - 4 specimens, 4 slides	12 Marks
ii)	Labelling of Anatomical diagrams provided (Two)	10 Marks
iii)	Permanent stained micro preparation	08 Marks
iv)	Study tour diary -	04 Marks
v)	Permanent stained micro preparation Submitted by examinee.....	04 Marks
vi)	Certified class record -	05 Marks
vii)	Check list of 20 locally available invertebrate fauna.....	02 Marks
viii)	Viva- voce	05 Marks
	Total: -	50 Marks

Note:

1) One or two short excursion / study tours are compulsory for observation of animals in their natural habitat.
2) Candidates shall be required to produce at the practical examination the following.
   - Practical record book duly signed by the teacher in charge and Certified by the Head of the department as bonafide work of the Candidate.
   - Five permanent stained micro preparations.
   - Study tour report and field diary duly signed by the teacher.

Reference Books Recommended (All latest editions):

1) Hickman, C.P. Jr.F.M. Hickman and L.S.Roberts, Integrated principles of Zoology Mosby College publication St.Louis.
2) Ayyar, E.K. and T.N.Ananthakrishnan, Manual of Zoology Vol.I (In-

8) Majpuria : Invertebrate Zoology.
9) Dhami and Dhami : Non-chordate Zoology.
10) Baini Prasad: Indian Zoological memoir. Pila.
11) R.L.Kotpal : Modern Text Book of Invertebrate Zoology.
12) Malviya M.K. Invertebrate Zoology, by Rajdhool publications.
13) S.S.Lal, Practical Zoology, Invertebrate.
14) Bhamrah H.S.and Kavita Juneja A text book of Invertebrate Zoology, Anmol Publication Pvt. Ltd,. New Delhi.
15) Verma and Agarwal Practical Zoology, Invertebrate
16) - Barnes R.D. Invertebrate Zoology -(W.B. Saunders Co.)
17) P.G.Puranik and Thakur, Invertebrate Zoology.

17. INDUSTRIAL FISH AND FISHERIES

(vocational)

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

			Marks
1)	Paper-I: FISH BIOLOGY		
	Theory (Written)	.....	80
	Internal assessments	.....	20
2)	Practical:	.....	50
		Total:	**150 Marks**

	Theory (Written)	 80
	Internal assessments	 20
2)	Practical:	 50
	Total :	**150 Marks**

2S-ZOOLOGY

CELL AND DEVELOPMENTAL BIOLOGY

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

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

UNIT-III: 1. Ultra structure and functions of nucleus and nucleolus.
2. Chromosome and its general organization.

3. Permeability tests using erythrocytes.
4. Preparation of Polytene chromosome in Chirnomous or Drosophila larva.
5. Preparation of various stages of mitosis in Onion root tip.
6. Preparation of various stages of meiosis in insect's testis.

II) Developmental Biology.

1. Study of stages of Gametogenesis in rat/frog, (Permanent Stained Slides)
2. Study of different of types animal eggs
3. Study of developmental stages (Life Cycle) of Cockroach, Housefly, mosquito, Butterfly, Moth, Frog (Any Four).
4. Sperm in physiological saline using phase contrast optics.
5. Demonstration of developing chick through available resources.
6. Developmental stages of frog: Cleavage, blastula, gastrula, neurula, and tadpoles through available resources.
7. Permanent slides of chick embryos at 24, 36, 48, 72 hrs of incubation.
8. Study of different types of placenta with suitable histological slides or visual diagrams.

Distribution of Marks during Practical Examination: Time : 4 hrs.

i)	Identification and comments on spots (1-8) – 4 Cytological, 4 Embryological	16 Marks
ii)	Cytological Preparation	10 Marks
iii)	Comments on given Life Cycle	10 Marks
iv)	Certified class record -	05 Marks
v)	Submission of photographs of any three crop pests	04 Marks

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

17. INDUSTRIAL FISH AND FISHERIES

(vocational)

There shall be a following paper and practical for B.Sc. Part-I Semester Two examination. The syllabus is based on 6 theory periods and

BSc.II Semester III
10. ZOOLOGY

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

Semester III

1)	Paper-I: Life and diversity of Chordata and concepts of evolution	**Marks Allotted**
	Written examination……..	80
	Internalassessment…….	20
2)	Practical:	50
	Total: ……..	**150 Marks**

Paper -3 S-Zoology
LIFE AND DIVERSITY OF CHORDATA AND CONCEPT OF EVOLUTION

Unit I : Phylum Chordata;

Origin of Chordata.

Protochordates:– Type study: Amphioxus: Habits and habitat , External Characters - Digestive system and feeding, Excretory organs, gonads- Affinities of Amphioxus.

2. **General characters and Classification up to orders of the following chordates or as per the availability in the laboratory from the major orders, (Specimens or Models):**
Protochordata: Herdmania, Doliolum Salpa, Amphioxus.
Agnatha: Petromyzon, Myxine.
Pisces: Scoliodon, Torpedo, Acipenser, Exocoetus. Hippocampus
Amphibia: Ichthyophis, Salamander, Bufo, Hyla.
Reptilia: Varanus, Phrynosoma, Chameleon, Cobra, krait, Russell's viper, Typhlops, Hydrophis
Aves: Duck, Woodpecker, Kingfisher, Parrot.
Mammalia: Mongoose, Squirrel. Manis. Bat., monkey,

B) Dissections:
1. Dissection - afferent and efferent branchial vessels, cranial nerves, internal ear of scoliodon.
2. Dissection - Digestive system, Arterial system, venous system, reproductive system of rat.
3. Permanent micro-preparations .a. Fish scales. b. Ampullae of Lorenzini. c. Eyeball muscles.
4. Observations of air bladder in air breathing fishes.

C) Osteology. Rabbit, Varanus (excluding loose bones of skull).

D) Evolution:
1. Study of fossils, including living fossils.
2. Study of Evidences of evolution.
   i) Analogous and Homologous organs.
   ii) Connecting links (Peripatus, Archaeopteryx, Limulus)
   iii) Embryological evidences
3. Application of Hardyweinberg`s law
4. Study of Mesozoic Reptiles (By Models/Charts).
5. Mimicry, coloration in animals.
6. Beak and Leg modifications with reference to: Parrot, Woodpecker, Kingfisher, Heron, Duck, Sparrow/Pigeon

organ and mechanism of respiration, circulatory System: Structure and working of Heart, major arteries and veins, Lateral line receptors, Migration in fishes-Types, causes and significance.

Unit II : Class Amphibia:

Type Study – *Rana tigerina*, Habits and habitat, external, characters. Respiratory organs- Circulatory system; Structure of Heart, major arteries and veins, urinogenital system.. Parental care in amphibia.

Class Reptilia:

Type study- *Calotes versicolor*- Habits and habitat, External characters, circulatory system- Structure of Heart, major arteries and veins. Urinogenital system, snake venom and anti-venom,

Unit III : Class Aves:

Type study: Pigeon-*Columba livia* Habits and habitat, External characters, Respiratory system,

urinogenital system. Flight adaptations, Migration in birds.

Class Mammalia:

Primitive mammals: salient features of Prototheria and Metatheria, Morphology of mammalian endocrine glands.

Aquatic mammals.

Unit IV : Evolution: Meaning and scope,

Indirect Evidences of evolution: Evidences of organic evolution- morphological and anatomical, physiological and biochemical, embryological.

Direct evidences of evolution: Paleontological evidences: Fossils and fossilization: petrified fossils dead and preserve bodies cast and moulds, trails and foot prints, condition for fossilizations.–, Radioactive carbon dating of fossils - Living fossils Importance of fossil record Evidences from

Amphioxus :	T.S, Oral hood, Pharynx, Tail
Frog :-	T.S. lung, Stomoch, Kidney, T.S. Intestine,
Rat :-	T.S. Liver, Pancrease, Ovary, Testies, Pituitary, Thyroid, Adrenal

DISTRIBUTION OF MARKS FOR PRACTICAL EXAMINATION.

1.	Dissection: -	10
2.	Permanent stained micro preparation.	05
3.	Spotting. (Specimens, Slides, bones, fossil)	10
4.	Practical on evolution -	10
5.	Class record	05
6.	Viva - Voce	05
7.	Submission of study tour report.	05
	Total Marks:	**50**

BSc.II Semester IV

ZOOLOGY

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

B.SC. FINAL, SEMESTER-V
10 : ZOOLOGY

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

Theory -5 S-ZOOLOGY:
(ANIMAL PHYSIOLOGY AND ECONOMIC ZOOLOGY)

		Marks Allotted
1)	Written examination……..	80
	Internal assessment…..……	20
2)	Practical:	50
	Total: ……	150 Marks

Paper 5 S-ZOOLOGY
(ANIMAL PHYSIOLOGY AND ECONOMIC ZOOLOGY)
Max. Marks - 100 Total **Period - 75**

iii) Those Institutions which are already having Zoology museums should not procure museum specimens now onwards and should use charts / slides / models / photographs and digital alternatives in case of need. Those new institutions which are not having Zoology museum in their department should provide learning related to zoological specimens with the help of charts / slides / models / photographs and digital alternatives / and arrange visit of students to already established museums.

Practicals:

1. Detection of blood groups in human being.
2. Differential counts of blood.
3. Estimation of hemoglobin percentage with the help of haemometer.
4. R.B.C. count.
5. W.B.C. count.
6. Preparation of haemin crystals
7. Measurement of blood pressure.
8. Action of salivary amylase on starch.
9. Qualitative detection of nitrogenous waste products (Ammonia, urea, uric acid) in given sample.
10. Demonstration of kymograph unit, Respirometer through available resources.
11. Observation and identification of Insect Pests of local crops, and predator insects.
12. Life Cycles of Honey bee, Lac insect, Silk Moth.
13. Histological Slides of major organs of Respiratory systems, circulatory system, Nervous system, Different types of Muscles, Endocrine glands, testis, ovary.
14. Study of locally available fishes, Indian major carps, Exotic carps, Common carp.

UNIT II : Muscle Physiology:

Types of Muscles: striated, non-striated and cardiac muscles

E.M. Structure and **Chemical** Composition of striated muscle, Neuromuscular junction.

Mechanism of muscle contraction by Sliding filament theory

Physical and Chemical changes during muscle contraction: muscle twitch, tetanus, isometric and isotonic contraction, summation of Stimuli, all or none law, fatigue, rigor mortis.

UNIT III : Nerve Physiology: Neuron: E.M. Structure of nuron andTypes : Myelinated and non-Myelinated nerve fibres.

Conduction of Nerve impulse, Resting potential, initiation and propagation of action potential, Saltatory transmission, Neurotransmitters (Acetylcholine, dopamine, GABA, Serotonin, Epinephrine, Nor-Epinephrine), Synapse and synaptic transmission

Chemical co-ordination: Endocrine system: Hormones and their physiological roles of-

Pituitary, Thyroid, Parathyroid, Adrenal, Islets of Langerhan's,
Hormonal disorders: Dwarfism, Gigantism, Acromegaly, Goiter, Myxoedema, Cretinism, Osteoporosis ,

UNIT IV : Reproductive Physiology: Estrous and menstrual

a) Spotting (A-F)	12
b) Description and Comments on Topic from Unit V and VI	08
04. Class record duly signed by teacher in charge and certified by H.O.D.	05
05. Study tour report.	05
06. Viva - voce	05
Total Marks	50

REFERENCES

1. Prosser and Brown : Comparative Animal Physiology
2. Hisotlogical Slides of Respirator systems, circulatory system, Muscles, Nervous system Endocrine glands, Gonads, placentae
3. Guyton : Physiology
4. Best and Taylor : Physiological basis of Medical practice
5. C Hoar, W.S.. General and comparative Physiology. Prentice Hall of India.
6. Lehninger. L.. Biochemistry. W.H. Freeman & co.
7. Nagabushnam, R.. Animal physiology. S.Chand & co.
8. Martin, D.W. P.A. Mayes and W.W. Rodwell,.Harper's Review of Biochemistry lange Medical Publications.
9. Prosser, C.L. and F.A.Brown Comparative Animal physiology. W.B. Suanders.
10. Rama Rao, A.V.S.S.. Biochemistry. UBSPD.
11. Stryer. L. Biochemistry Wiley International
12. Verma, P.S. and V.K. Agarwal.. Animal physiology. S.Chand & co.
13. Wilson, J.A., Principles of Animal Physiology, Macmillan
14. Chatterjee, C.J; Human Physiology(Vol-I and II)
15. Economic Zoology, G.S. Shukla, V.B. Upadhyay (2006)
16. Text Book of Applied Zoology, Pradip. V Jabde (2005).
17. Mac E. Hadley: Endocrinology, Prentice Hall, International Edi-

Unit V **14L**

A] Thermodynamics and Equillibrium: **[10]**

(i) Gibb's and Helmholtz's free energy function. Physical significance of Gibb's free energy, Change in free energy as a criteria of spontaneity and equilibrium. Variation of free energy G with P & T. Gibb's-Helmholtz's equation in terms of G and its application. (ii) Partial molal function, chemical potential, derivations of Gibb's-Duhem equation. Chemical potential of an ideal gas in gaseous mixture. Derivation of vant Hoff's isotherm and its application to equilibrium state. Derivation of vant Hoff's equation and its applications. (iii) Numericals.

B] Phase Equillibrium: **[4]**

(i) Immiscible liquids, Nerst distribution law and its application to association and dissociation of solute in one of the solvent. Process of extraction, derivation of formula for the amount of solute left unextracted after n^{th} extraction. (ii) Phase transition - Clausius-Clyperon equation (only qualitative statement). (iii) Partially miscible liquids - Phase diagram of phenol-water, triethyl amine - water and nicotine-water systems. (iv) Numericals.

Unit VI **14L**

A] Liquid state: **[4]**

(i) Surface tension, determination and its S.I. Unit. Effect of temperature on surface tension, derivation of expression for relative surface tension by Drop number method. Application of surface tension. (ii) Viscosity, determination and its S.I. Unit. Effect of temperature on viscosity, derivation of expression for relative viscosity by Ostwald's viscometer method. Applications of viscosity.

B] Electrochemistry: **[10]**

(i) Conductance of electrolyte solution. Specific, equivalent and molar conductance. Determination of conductance of electrolyte solution, variation of specific and equivalent

Semester- III

3S Chemistry Practicals

Total Laboratory sessions: 26 **Marks: 50**

Exercise I:

a) Volumetric Analysis

(Standard solutions to be prepared by students only)

16 Laboratory sessions

1) Prepare 0.1N oxalic acid standard solution and find out the acid neutralizing capacity of an antacid using NaOH as an intermediate solution.
2) Prepare 0.1N H_2SO_4 solution and find out its exact normality using NaOH as an intermediate solution and 0.1N oxalic acid as standard solution.
3) To determine the strength of oxalic acid by titration with $KMnO_4$.
4) To determine percentage purity of Ferrous Ammonium Sulphate (FAS) by titration with $KMnO_4$.
5) To determine strength of FAS by titration with $K_2Cr_2O_7$ using internal indicator.
6) To determine strength of $K_2Cr_2O_7$ by titration with FAS using internal indicator.
7) Estimation of copper (II) in commercial copper sulphate sample by iodometric titration.

b) Gravimetric Analysis

Estimation of Ba^{2+} as $BaSO_4$, Fe^{3+} as Fe_2O_3 using china and silica crucible and Ni^{2+} as Ni-DMG using sintered glass crucible.

Exercise II: Physical Chemistry experiments

10 Laboratory sessions

1) To determine refractive index by Abbe's refractometer.
2) To construct phase diagram of phenol-water system and to determine consolute temperature for the system.

3 : CHEMISTRY
Semester-V
5S Chemistry
(Effective from session 2015-16)

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

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

5S Chemistry

Total Lectures: 84 ***Marks: 80***

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

Unit I **14L**

A] Coordination Compounds: Important terms namely molecular or addition compounds, double salts, complex salts, complex ion, ligand, coordination number, central metal ion, etc. Werner's theory of coordination and its experimental verification on the basis of conductance data and formation of AgCl precipitate in case of cobaltammines. Sidgwick's electronic interpretation and its drawbacks, effective atomic number. IUPAC rules for nomenclature of coordination compounds. Structural isomerism-ionization, linkage and coordination in complexes. Geometrical isomerism in octahedral complexes of the type Ma_4b_2, Ma_3b_3, $Ma_2b_2c_2$, Ma_4bc, $M(AA)_2b_2$. Square planar complexes of the type Ma_2b_2 and Ma_2bc. Optical isomerism in octahedral complexes of type $Ma_2b_2c_2$, Mabcdef, $M(AA)_3$, $M(AA)_2b_2$ and tetrahedral complexes of the type Mabcd and $M(AA)_2$. Optical isomerism in square planar complexes. Valence bond theory as applied

B] Chelates : Definition, classification and applications of chelates in analytical chemistry. Stability of chelate with special reference to chelate effect. **[3]**

Unit II **14L**

A] Crystal Field Theory (CFT): Postulates of CFT, Crystal field splitting in octahedral, distorted octahedral, square planar tetrahedral complexes, concept of CFSE, high spin and low spin complexes on the basis of $Ä_0$ and pairing energy, distribution of electrons in t_{2g} and e_g orbitals in high spin and low spin octahedral complexes. Factor affecting magnitude of crystal field splitting in octahedral complexes. **[8]**

B] Electronic Spectra of Transition Metal Complexes : Introduction to spectra, selection rules for d-d transitions, spectroscopic terms-determination of ground term symbols for d^1 to d^{10}, spectra of d^1 and d^9 octahedral complexes, Orgel diagram for d^1 and d^9 states, electronic spectrum of $[Ti(H_2O)_6]^{3+}$ complex ion. Spectrochemical series. **[6]**

Unit III **14L**

A] Heterocyclic compounds: Nomenclature, Pyrrole: Synthesis from acetylene, succinimide and furan, Basicity, Electrophilic substitution reactions (orientation) – nitration, sulphonation, acetylation and halogenation , Molecular orbital structure. **[4]**

Pyridine: Synthesis from acetylene and pentamethylene diamine hydrochloride, Basicity, Electrophilic substitution reactions (orientation) – nitration, sulphonation, Nucleophilic substitution reactions (orientation)- with $NaNH_2$, C_6H_5Li and KOH. **[3]**

B] Organometallic compounds: Grignard reagents: Methyl magnesium bromide- Synthesis from methyl bromide (only reaction) Synthetic applications: Electrophilic substitution reactions-formation of alkanes, alkenes, higher alkynes and other organometallic compounds, Nucleophilic substitution

Computer Science

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20. COMPUTER SCIENCE

OR

20. COMPUTER APPLICATION

OR

20. INFORMATION TECHNOLOGY

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

The distribution of marks in Practical examination is given as. :

1)	Program writing / execution (on group A & B)	: 30 marks
2)	Practical / Record	: 10 marks
3)	Viva-voce	: 10 marks
	Total	**50 marks**

2S : Computer Science or
Computer Application or
Information Technology
Data Structure and Advance C

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

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

UNIT-III : Tree : Binary, Binary search tree, tree Traversing : inorder, preorder and postorder, sorting and searching Techniques : Bubble sort, insertion sort and selection sort, linear search, Binary search.

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

Practical : Minimum 16 Practical based on

A. Data structure using C Language

B. C language covering aspectus of syllabus .

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

Hardware :

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

II) Accessories
   1) Pen. Drives 2 Nos.
   2) Printer Ribbon / Tonner
   3) Stabilizer / UPS
   4) Internet facility

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

1) Introduction to Data structure : Tremble, Sorenson.
2) Introduction to Data structure : Bhagat Singh , Mops.
3) Fundamentals of Comp Algorithm : Horowitz & Sahani.
4) Introduction to Data Structure in C : Pearson.
5) Programming in C : E Balguruswami : TMH Publication.
6) Programming with C : Venugopal K.R. TMH, Publication.
7) Programming in ANSIC : Ramkumar and Rakesh Agrwal
8) Programming with C : Byson Gottfried , Schaum Series Publication.

21. COMPUTER APPLICATION (VOCATIONAL)

5. S.C.Gupta, V.K. Kapoor: Fundamentals of Applied Statistics, Sultan Chand and sons.
6. Cochran W.G. and Cox G.M.(1957): Experimental Designs, John Wiley and Sons.
7. Das M.N. and Giri (1986):Design and Analysis of Experiments, Springer Verlag.
8. Goon A.N., Gupta M.K. , DasGupta B.(1986): Fundamentals of Statistics, Vol.II, World Press Calcutta.
9. Kempthorne O. (1965):The Design and Analysis f Experiments, Wiley Eastern.
10. Clark: Statistics and Experimental Designs.

List of Practicals : (6S Statistics)

1. Solution of LPP by graphical method.
2. Solution of LPP by simplex method.
3. Computation of initial basic feasible solution to transportation problem by various methods.
4. Problems on assignment problem.
5. Problems on sequencing problem with n jobs with two machines.
6. Problems on two-person zero sum games with saddle points.
7. ANOVA: One way classification.
8. ANOVA: Two way classification with one observation per cell.
9. ANOVA: Two way classification with multiple but equal number of observations per cell.
10. Analysis of completely randomised design.
11. Analysis of randomised block design.
12. Analysis of Latin square design.
13. Analysis of 2^2 and 2^3 factorial experiments arranged in RBD.

Note : The above practicals may be performed by using various statistical softwares.

List of equipments and instruments required for a batch of students in U.G. statistics laboratory.

1. Twelve digit desk model electronic calculators. 20
2. Biometrica tables Vol.I and Vol. II 02
7. Statistical poster and chart 02
8. Statistical softwares like SPSS, SAS, MS Excel and R

12 : COMPUTER SCIENCE

5S-COMPUTER SCIENCE
RDBMS AND VISUAL BASIC

UNIT-I : Fundamental of DBMS : Architecture of a database system,, data independence, database models; Relational Hierarchical, network; data dictionary.

UNIT-II: Relational Model : Relations, Domains and Attributes keys, E-R diagrams, Reducing E-R diagrams to tables, function dependency, Normalization Process, Normal forms : 1NF, 2NF, 3NF, 4NF, BCNF.

UNIT-III : Introduction to SQL : Components of SQL, data types, operators, DDL Commands : CREATE, ALTER, DROP, for tables & views. DML Commands : SELECT, INSERT, DELETE & UPDATE; Clauses : ORDER BY, GROUP BY and HAVING;

UNIT-IV : Introduction to Visual Basic : Visual programming, event driven programming, VB Environment : New Project window, property window, Form layout window, toolbar, menu bar, tool box, form window;
Managing Control : Form properties, pointer tool, label control, text box, command button, picture box, image control, event procedure.

UNIT-V: Creating Menus : Application wizard for menu, menu editor, creating menu, adding code to menus, data types & variables.
Operators : Conditional operators, logical operators, control structures : If-else, Nested If—else, select case, goto, do loop, for loop, nested for loop.

UNIT-VI : Introduction to Internal Functions : Msgbox(), named constant, default buttons, specifying icons.