# GOVT. DIGVIJAY P.G. AUTONOMOUS COLLEGE RAJNANDGAON (C.G.)

## DEPARTMENT OF ZOOLOGY

# B.Sc. Zoology
# Honours
# &
# Honours with Research

## (FYUGP/LOCF- V)

(Syllabus Based on UGC-LOCF Curriculum)

## (2025 – 2026)

**(Approved by Board of Studies)**
**Effective from July 2025-26**
**As Per provisions of NEP 2020 to be implemented from academic year 2022-23**

# GOVT. DIGVIJAY AUTONOMOUS PG COLLEGE, RAJNANDGAON (C.G.)

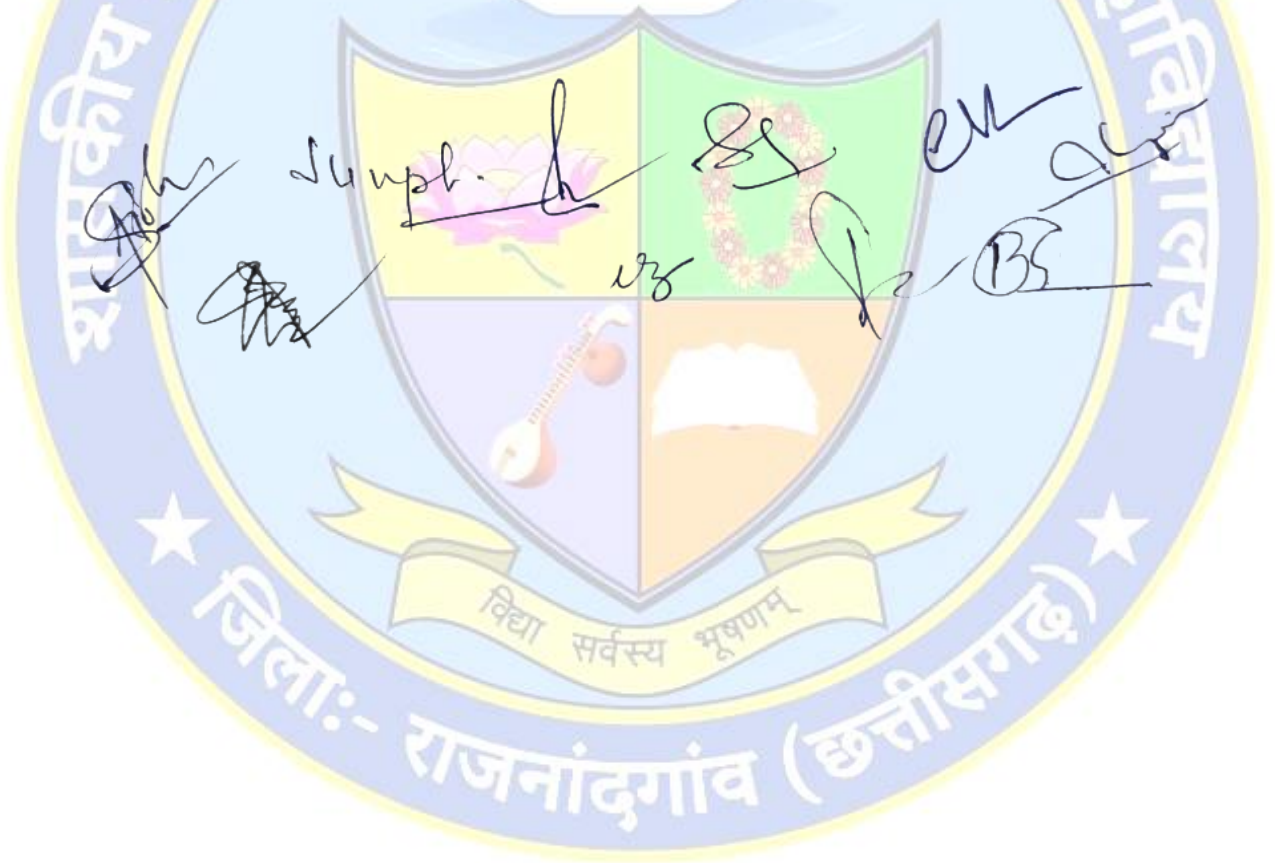
## Department of Zoology

## Syllabus of FYUGP/LOCF Curriculum

## B.Sc. Zoology Honours & Honours with Research Course

## V Semester Session: 2025-26

| Sem | Course | Course Name | Credit | Lecture | Internal Marks | ESE Max Marks | M.M. |
|---|---|---|---|---|---|---|---|
| V | DSC -V | Evolutionary Biology | 3 | 45 | 20 | 80 | 100 |
| | | Lab Course | 1 | 15 | - | - | 50 |
| | SEC-V | Aquaculture | 2 | 30 | 10 | 40 | 50 |
| | DSE III | Human Reproductive Biology | 3 | 45 | 20 | 80 | 100 |
| | | Lab Course | 1 | 15 | - | - | 50 |
| | DSE IV | Food Nutrition & Health | 3 | 45 | 20 | 80 | 100 |
| | | Lab Course | 1 | 15 | - | - | 50 |
| Total | | | 14 | 210 | 70 | 200 | 500 |



GOVT. DIGVIJAY AUTONOMOUS PG COLLEGE RAJNANDGAON (C.G.)

**FYUGP (CBCS and LOCF Pattern)**

**Department of Zoology**

| | |
|---|---|
| **Session: 2025-26** | **Program: B.Sc.** |
| **Semester: V** | **Subject: Zoology** |
| **Course type: DSC- V** | **Course Code:** |
| **Course Title : Evolutionary Biology** | |
| **Credit: 04 (03+01)** | **Lecture – 60 (45+15)** |
| **MM: 100 = (ESE 80+IA 20)** | **Minimum Passing Marks: 40%** |

| **Title** | **Evolutionary Biology** |
|---|---|
| **Course Learning Outcome:** | After successfully completing the course, the students will be able to<br>• Develop a holistic appreciation on the phylogeny and adaptations in animals.<br>• Enable the students to understand the evolution of universe and life. |
| **Program Specific Outcome:** | Understanding on the process and theories in evolutionary biology.<br>• Examine the evolutionary history of the taxa based on developmental affinities.<br>• Understand the process of evolution.<br>• Evolution of life forms in through geological time scale.<br>• To trace the phylogeny of species. |

| Unit | Lectures | Topics | Credits |
|---|---|---|---|
| **I** | 10 | **Origin of Life & Evidence of Evolution**<br>• Theories of Origin of Life.<br>• Historical review of evolutionary concept: Lamarckism, Darwinism, Neo-Darwinism.<br>• Hardy-Weinberg Law (statement and derivation of equation, application of law to human Population).<br>• Natural selection (concept of fitness, selection coefficient, types of selection, density-dependent selection, sexual selection.<br>• Genetic Drift (mechanism, founder's effect, bottleneck phenomenon)<br>• Role of Migration and Mutation.<br>• Evidences of Evolution. | 0.75 |
| **II** | 10 | • Variation: Heritable variations and their role in evolution.<br>• Isolating mechanism<br>• Fossil record (types of fossils, transitional forms)<br>• Ggeological time scale & Zoogeographical realims. | 0.75 |
| **III** | 10 | • Micro evolutionary changes (Inter population variations, clines, races)<br>• Species concept<br>• Modes of speciation- allopatric, sympatric.<br>• Macro evolution (Adaptive Radiation) (exemplified by Galapagos finches) | 0.75 |
| **IV** | 15 | **Origin and evolution of man and the interpretation method**<br>• Evolution of horse<br>• Evolution of man. (Primate phylogeny from Dryopithecus leading to Homo sapiens)<br>• Phylogenetic trees (construction of phylogenetic trees) | 0.75 |
| **Lab course** | 15 | 1. Study of Types of fossils & Forms from models/pictures.<br>2. Study of homology and analogy from suitable specimens.<br>3. Study and verification of Hardy-Weinberg Law by *chi* square | 01 |

| | | | |
|---|---|---|---|
| | | analysis.<br>4. Construction of cladograms based on morphological characters.<br>5. Construction of phylogenetic tree with the help of bioinformatics tools (Clustal X, Phylip, MLK) and its interpretation.<br>6. Study of variations in a sample human population:<br>(a) Continuous variation: Height/Weight in relation to age and sex<br>(b)Discontinuous variation: Ability/Inability to taste Phenyl thiocarbamide (PTC).<br>7. Demonstration of role of natural selection and genetic drift in changing allelic frequencies using simulation studies.<br>8. Graphical representation and interpretation of data of height/ weight of a sample. 82 of 100 humans in relation to their age and sex.<br>9. Group discussion or Seminar presentation on one or two related topics from the list.<br>10. Field Visit of Anthropological Museum, Pre Historic Places, Rock Art Sites. | |
| **Recommended Books** | | • Ridley, M (2004) Evolution (3rd edition) Blackwell publishing.<br>• Hall, B.K. and Hallgrimson, B (2008) Evolution (4th edition) Jones and Barlett Publishers.<br>• Campbell, N.A. and Reece J.B (2011) Biology (9th edition) Pearson, Benjamin, Cummings.<br>• Douglas, J.F. (1997) Evolutionary Biology. Sinauer Associates.<br>• Pevsner, J. (2009) Bioinformatics and Functional Genomics (2nd edition) WileyBlackwell. | |

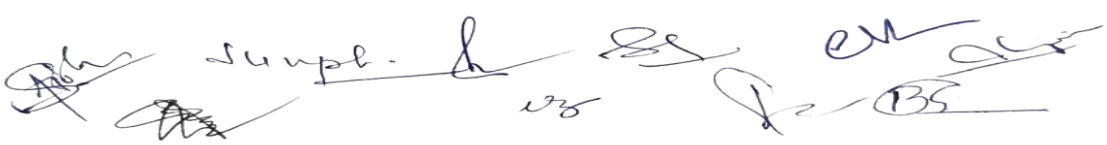
**Evaluation Scheme**

| Evaluation Scheme | Sections in Question Paper | Question type | Word Limit | No. of Questions | Marks per Question | Total |
|---|---|---|---|---|---|---|
| **External** | A | Very Short answer type | 50 | 8 | 2 | 16 |
| | B | Short answer type | 100 | 4 | 6 | 24 |
| | C | Long answer type | 200 | 4 | 10 | 40 |
| **Internal** | **Based on CT & Assignment/Project** | | | | | 20 |
| | **Total =** | | | | | 100 |

**Evaluation Scheme of Practical**

| | | |
|---|---|---|
| **Practical** | Experiment 01 | 12 |
| | Experiment 02 | 08 |
| | Experiment 03 | 04 |
| | Spotting | 16 |
| | Viva | 05 |
| | Sessional | 05 |
| **Total -** | | **50** |

**********0****0*****0**********



GOVT. DIGVIJAY AUTONOMOUS PG COLLEGE RAJNANDGAON (C.G.)

**FYUGP (CBCS and LOCF Pattern)**

**Department of Zoology**

| | |
|---|---|
| **Session: 2025-26** | **Program: B.Sc.** |
| **Semester: V** | **Subject: Zoology** |
| **Course type: SEC- V** | **Course Code:** |
| **Course Title : Aquaculture** | |
| **Credit: 02** | **Lecture – 30** |
| **MM: 50 = (ESE 40+IA 10)** | **Minimum Passing Marks: 40%** |

| **Title** | **Aquaculture** |
|---|---|
| **Course Learning Outcome:** | About the course this course will give the students an understanding of the principles of aquaculture, including production systems, water quality, nutrition, spawning, larval culture and culture methodologies with special reference to fish, and prawn. The course will include an opportunity to conduct hands-on activities related to culture and husbandry of animals. |
| **Program Specific Outcome:** | Learning outcomes After completing this course the learners will be able to understand the aquaculture systems<br>• Understand conditioning factors and how they can be manipulated.<br>• Describe water depuration mechanisms.<br>• Understand the environmental impacts of aquaculture. |

| **Unit** | **Lectures** | **Topics** | **Credits** |
|---|---|---|---|
| **I** | 07 | **Freshwater aquaculture systems**<br>• Aquaculture concept.<br>• Culture systems: Freshwater prawn culture, fish culture in paddy fields, Brackish water culture, Mariculture: Oyster culture, Crab culture, Lobster culture, mussel culture, culture of Eels, Culture of aquatic weeds.<br>• Composite fish culture: Definition and various patterns. Mixed fish farming in India,Techniques of composite culture.<br>• Cray fish culture. | 0.50 |
| **II** | 07 | **Preparation and management of fish culture ponds**<br>• Nursery ponds.<br>• Predatory and Weed fishes and their control.<br>• Fish toxicants.<br>• Fertilization.<br>• Aquatic insects and their control.<br>• Fish food organisms and their production.<br>• Transport of fish seed and Brood fish. | 0.50 |
| **III** | 07 | **Fish pathology**<br>• Parasitic infections.<br>• Fungus infections.<br>• Protozoan diseases.<br>• Worm diseases.<br>• Non parasitic diseases. | 0.50 |
| **IV** | 09 | • Pearl culture: Introduction, Pearl producing mollusks, pearl formation, collection of oysters, Rearing of oysters, insertion of | 0.50 |

| | | | |
|---|---|---|---|
| | | nucleus, harvesting of pearls, composition & quality of pearl.<br>• Recirculation technology, Geographic Information System (GIS) technology, passive Acoustics in fisheries.<br>• Use of Information Communication Technology (lCT) in fishes: production aspects, marketing aspects. | |
| **Recommended Books** | | • Jingran, V. G. (1983) Fish and fisheries of India , Hindustan pub. corp. New Delhi.<br>• Hute, M. and Kahn, H. (2000) Textbook of fish culture, Blackwell Scientific Publication, Australia.<br>• Srinivasulu, M., Reddy, K.R.S., Rao, S. (1999) Text book of Aquaculture, Discovery Publishing House New Delhi.<br>• Yawn Mehta, Fisheries & Aquaculture Biotechnology (2011) Campus Books International, Prahalad street, Ansari Road, Durga Ganj, New Delhi. | |

**Evaluation Scheme**

| Evaluation Scheme | Sections in Question Paper | Question type | Word Limit | No. of Questions | Marks per Question | Total |
|---|---|---|---|---|---|---|
| **External** | | Short Answer type | 250 | 8 | 5 | 40 |
| **Internal** | **Based on CT & Assignment/Project (5+5)** | | | | | 10 |
| | | **Total =** | | | | 50 |

**********0****0*****0**********

# GOVT. DIGVIJAY AUTONOMOUS PG COLLEGE RAJNANDGAON (C.G.)

**FYUGP (CBCS and LOCF Pattern)**

**Department of Zoology**

| | |
|---|---|
| **Session: 2025-26** | **Program: B.Sc.** |
| **Semester: V** | **Subject: Zoology** |
| **Course type: DSE- III** | **Course Code:** |
| **Course Title : Human Reproductive Biology** | |
| **Credit: 04 (03+01)** | **Lecture – 60 (45+15)** |
| **MM: 100 = (ESE 80+IA 20)** | **Minimum Passing Marks: 40%** |

| **Title** | **Human Reproductive Biology** |
|---|---|
| **Course Learning Outcome:** | • Get in-depth understanding of morphology, anatomy and histology of male and female reproductive organs.<br>• Know different processes in reproduction starting from germ cell formation to fertilization and consequent pregnancy, parturition and lactation.<br>• Compare estrous and menstrual cycles and their hormonal regulation. |
| **Program Specific Outcome:** | • Comprehend the interplay of various hormones in the functioning and regulation of the male and female reproductive systems.<br>• Know about the diagnosis and management of infertility, including latest methods, technologies and infrastructure in assisted reproduction.<br>• Practically understand the modern methods in contraception and their use in family planning strategies. |

| **Unit** | **Lectures** | **Topics** | **Credits** |
|---|---|---|---|
| **I** | 10 | **Reproductive Endocrinology**<br>Hypothalamo–hypophyseal–gonadal axis. Regulation of gonadotropins and gonadal steroids secretion in male and female;Steroidogenesis;Puberty; Mechanism of action of hormones related to reproduction. | 0.75 |
| **II** | 10 | **Male Reproductive System**<br>Functional histology and anatomy of male reproductive system: Testis, epididymis, vas deferens, prostate gland, seminal vesicle; Spermatogenesis and its regulation; Sperm transport and maturation in male genital tract. | 0.75 |
| **III** | 10 | **Female Reproductive System**<br>Functional histology and anatomy of female reproductive system:Ovary, fallopian tubes/oviducts, uterus, cervix and vagina; Folliculogenesis; Oocyte maturation and ovulation;<br>Corpus luteum formation and regression; Reproductive cycles (estrous and menstrual) and their regulation; changes in the female tract during these cycles.Fertilization; Implantation. Maternal recognition of pregnancy; Feto-placentalunit; Hormonal regulation of gestation; gestational adaptations; Parturition and its hormonal regulation; Lactation and its regulation. | 0.75 |
| **IV** | 15 | **Reproductive Health and Family Planning**<br>Contraceptive methods; Infertility in male and female: causes, diagnosis and management; Assisted Reproductive Technologies: sperm banks, frozen embryos, IVF, ET, EFT, IUT, ZIFT, GIFT, ICSI, PROST. | 0.75 |
| **Lab course** | 15 | 1. Study of animal house: Set up and maintenance of animal house, breeding techniques, care of normal and experimental animals.<br>2. Examination of vaginal smear of rats (from live animals).<br>3. Surgical techniques: principles of surgery in endocrinology. | 01 |

| | | | |
|---|---|---|---|
| | | 4. Ovariectomy, hysterectomy, castration and vasectomy in rats.<br>5. Examination of histological sections from photomicrographs/ permanent slides of rat/human: testis, epididymis and accessory glands of male reproductive systems, Sections of ovary, fallopian tube, uterus (proliferative and secretary stages)<br>6. Human vaginal exfoliate cytology through micrographs.<br>7. Sperm count and sperm motility in rat.<br>8. Study the effect of cryptorchidism on sperm count and motility in rats.<br>9. Study of modern contraceptive devices.<br>10. Mini projects involving survey, data collection, statistical analysis and submission of a project report on reproductive health of a small human community. | |
| **Recommended Books** | | • Jones, R.E. and Lopez, K.H. (2014) Human Reproductive Biology.IV Edition, Elsevier.<br>• Johnson, M.H. and Everitt, B.J. (1995) Essential reproduction. IV Edition, London, Blackwell Science (Eighth edition by Johnson, MH., 2018)<br>• Hatcher, R.A. et al. (1997). The Essentials of Contraceptive Technology. Population Information Programme. John Hopkins School of Public Health.<br>• Robert Martin (2013). How We Do It: The Evolution and Future of Human Reproduction. Basic Books.<br>• Peter T. Ellison (2001). On Fertile Ground: A Natural History of Human Reproduction. Harvard University Press. | |

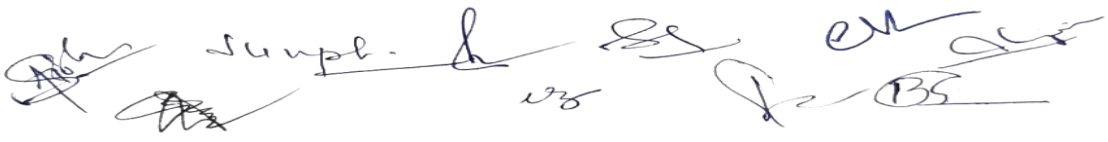
**Evaluation Scheme**

| Evaluation Scheme | Sections in Question Paper | Question type | Word Limit | No. of Questions | Marks per Question | Total |
|---|---|---|---|---|---|---|
| **External** | A | Very Short answer type | 50 | 8 | 2 | 16 |
| | B | Short answer type | 100 | 4 | 6 | 24 |
| | C | Long answer type | 200 | 4 | 10 | 40 |
| **Internal** | **Based on CT & Assignment/Project** | | | | | 20 |
| | **Total =** | | | | | 100 |

**Evaluation Scheme of Practical**

| | | |
|---|---|---|
| **Practical** | Experiment 01 | 12 |
| | Experiment 02 | 08 |
| | Experiment 03 | 04 |
| | Spotting | 16 |
| | Viva | 05 |
| | Sessional | 05 |
| **Total -** | | **50** |

**********0****0*****0**********



GOVT. DIGVIJAY AUTONOMOUS PG COLLEGE RAJNANDGAON (C.G.)

**FYUGP (CBCS and LOCF Pattern)**

**Department of Zoology**

| | |
|---|---|
| **Session: 2025-26** | **Program: B.Sc.** |
| **Semester: V** | **Subject: Zoology** |
| **Course type: DSE- VI** | **Course Code:** |
| **Course Title : Food, Nutrition and Health** | |
| **Credit: 04 (03+01)** | **Lecture – 60 (45+15)** |
| **MM: 100 = (ESE 80+IA 20)** | **Minimum Passing Marks: 40%** |

| | |
|---|---|
| **Title** | **Food, Nutrition and Health** |
| **Course Learning Outcome:** | • Students will be able to interpret and apply nutrition concepts to evaluate a improve the nutritional health of communities.<br>• Students will be able to interpret and apply nutrition concepts to evaluate a improve the nutritional health of individuals with medical conditions.<br>• Students will be able to identify and apply food principles to food and nutriti systems. |
| **Program Specific Outcome:** | • Students will be able to apply management principles to evaluate human, physical and fiscal resources in organizations.<br>• Students will be able to integrate knowledge and skills in food and nutrition with professional issues affecting the nutrition and/or dietetics fields. |

| Unit | Lectures | Topics | Credits |
|---|---|---|---|
| **I** | 10 | **Basic concept of food and nutrition**<br>• Food Components and food-nutrients.<br>• Concept of a balanced diet, nutrient needs and dietary pattern for various groups- adults, pregnant and nursing mothers, infants, school children, adolescents and elderly.<br>• Food Pyramid, Nutritional anthropometry- BMI, waist-to-hip ratio, skin-fold test, interpretation of these measurements. | 0.75 |
| **II** | 10 | **Nutritional Biochemistry**<br>• Carbohydrates, Lipids, Proteins, their dietary source and role Vitamins- their dietary source and importance.<br>• Minerals- their biological functions.<br>• Dietary Fibres - Definition, their dietary source and nutritional importance. | 0.75 |
| **III** | 10 | **Health**<br>• Definition and concept of health, Major nutritional Deficiency diseases- (kwashiorkor and marasmus).<br>• Deficiency disorders, their causes, symptoms, treatment, prevention and government programmes, if any.<br>• Life style related diseases- hypertension, diabetes mellitus, Atherosclerosis and obesity- their causes and prevention through dietary and lifestyle modifications.<br>• Social health problems- smoking, alcoholism, drug dependence and Common ailments- cold, cough, and fevers, their causes and treatment. | 0.75 |
| **IV** | 15 | **Food hygiene**<br>• Food and Water borne infections;<br>a. Bacterial infection: Cholera, typhoid fever, dysentery;<br>b. Viral infection: Hepatitis, Poliomyelitis.<br>c. Protozoan infection: amoebiasis, giardiasis.<br>d. Parasitic infection: taeniasis and ascariasis their | 0.75 |

| | | | |
|---|---|---|---|
| | | transmission, causative agent, sources of infection,Symptoms and prevention.<br>• Brief account of food spoilage: Causes of food spoilage and their preventive measures. | |
| **Lab course** | 15 | 1. To detect adulteration in a) Ghee b) Sugars c) Tea leaves and d) Turmeric.<br>2. Estimation of Lactose in milk and diagnosis of lactose intolerance by measuring hydrogen gas during expiration.<br>3. Ascorbic acid estimation in food by titrimetry.<br>4. Estimation of Calcium in foods by titrimetry.<br>5. Study of the stored grain pests from slides/photographs (*Sitophilus oryzae, Trogoderma granarium, Callosobruchus chinensis* and *Tribolium castaneum*): their identification, habitat and food sources, damage caused and control. Preparation of temporary mounts of the above stored grain pests.<br>6. Visit to food testing lab /or any agency of food standards.<br>7. Project work.<br>8. Undertake computer aided diet analysis and nutrition counselling for different age groups.<br>9. Identify nutrient rich sources of foods (fruits and vegetables), their seasonal availability and price.<br>10. Study of nutrition labeling on selected foods.<br>11. Study of Preservatives Used of Packed Food available in Local Market.<br>12. Make a Project report on Factory Sanitation, Packaging of Food Products in Local Food Industries.<br>13. Study of *FSSAI* regulation & procedure of Certification. | 01 |
| **Recommended Books** | | • Shashi Goyal & Pooja Gupta. Food, Nutrition and Health (ISBN: 9788121940924)<br>• Linda Tapsell. Food, Nutrition and Health. I Edition, Oxford (ISBN: 978-0195518344)<br>• Gibney MJ et al. (eds) (2009) Introduction to Human Nutrition. Wiley-Blackwell A John Wiley & Sons Ltd, Nutritional Society.<br>• Mann J and Truswell SA, Essentials of Human Nutrition, Oxford University Press. | |

**Evaluation Scheme**

| Evaluation Scheme | Sections in Question Paper | Question type | Word Limit | No. of Questions | Marks per Question | Total |
|---|---|---|---|---|---|---|
| **External** | A | Very Short answer type | 50 | 8 | 2 | 16 |
| | B | Short answer type | 100 | 4 | 6 | 24 |
| | C | Long answer type | 200 | 4 | 10 | 40 |
| **Internal** | **Based on CT & Assignment/Project** | | | | | 20 |
| **Total =** | | | | | | 100 |

**Evaluation Scheme of Practical**

| | | |
|---|---|---|
| **Practical** | Experiment 01 | 12 |
| | Experiment 02 | 08 |
| | Experiment 03 | 04 |
| | Spotting | 16 |
| | Viva | 05 |
| | Sessional | 05 |
| **Total -** | | **50** |

**********0****0*****0**********