



List of Courses which focuses on Professional Ethics, Gender, Human Values, Environment & Sustainability and other value framework

Department : *Zoology*

Programme Name : *B.Sc.*

Academic Year : *2019-20*

Courses which focuses on Professional Ethics, Gender, Human Values, Environment & Sustainability and other value framework:

Sr. No.	Course Code	Name of the Course
01.	LS/ZOO/CC-102 L	Principles of Ecology
02.	LS/ZOO/GE-101 L	Aquatic Biology
03.	LS/ZOO/GE-201 L	Environment and Public Health
04.	LS/ZOO/AE-201/ES	Environmental Science
05.	LS/ZOO/GE-401 L	Insect, Vectors and Diseases
08.	ZOO-502	Ecology and Evolution
09.	ZOO-DSE-2 (E)	Toxicology

V. K. Bhatta

सहायक
HEAD
बसु विज्ञान विभाग
Department of Zoology
गुरु घासीदास विश्वविद्यालय, बिलासपुर
Guru Ghasidas Vishwavidyalaya, Bilaspur



Scheme and Syllabus

B.Sc. Hon's (Zoology): CBCS 2018-2019

School of Life Sciences

Semester I				
Course Opted	Course Code	Name of the course	Credit	H/week
Core Course-1 Theory	LS/ZOO/CC-101 L	Non Chordates - I (Protozoa to Pseudocoelomate)	4	4
Core Course-1 Practical	LS/ZOO/CC-101 P	Lab Course	2	4
Core Course-2 Theory	LS/ZOO/CC-102 L	Principles of Botany	4	4
Core Course-2 Practical	LS/ZOO/CC-102 P	Lab Course	2	4
Generic Elective-1 Theory	LS/ZOO/GE-101 L	Aquatic Biology	4	4
Generic Elective-1 Practical	LS/ZOO/GE-101 P	Lab Course	2	4
Ability Enhancement Compulsory Course-1	LS/ZOO/AE-101/EC	English Communication / MIL (Hindi Communication)	4*	4
Extracurricular activity		Tour, Field visit/ Industrial training/ NSS/ Swachhta/ Vocational Training/ Sports/ others	2	(2)
TOTAL			24	28
Semester II				
Core Course-3 Theory	LS/ZOO/CC-201 L	Non Chordates - II (Coelomates)	4	4
Core Course-3 Practical	LS/ZOO/CC-201 P	Lab Course	2	4
Core Course-4 Theory	LS/ZOO/CC-202 L	Cell Biology	4	4
Core Course-4 Practical	LS/ZOO/CC-202 P	Lab Course	2	4
Generic Elective-2 Theory	LS/ZOO/GE-201 L	Environment and Public Health	4	4
Generic Elective-2 Practical	LS/ZOO/GE-201 P	Lab Course	2	4
Ability Enhancement Compulsory Course-2	LS/ZOO/AE-201/ES	Environmental Science	4*	4
Extracurricular activity		Tour, Field visit/ Industrial training/ NSS/ Swachhta/ vocational Training/ Sports/ others	2	(2)
Total			24	28
Summer Internship: 15 days		Swachta Swachhta / NSS / Industrial/ others	2	100
Semester III				
Core Course-5 Theory	LS/ZOO/CC-301 L	Diversity of chordates	4	4
Core Course-5 Practical	LS/ZOO/CC-301 P	Lab Course	2	4
Core Course-6 Theory	LS/ZOO/CC-302 L	Physiology: COORDINATING AND COORDINATING systems	4	4
Core Course-6 Practical	LS/ZOO/CC-302 P	Lab Course	2	4
Core Course-7 Theory	LS/ZOO/CC-303 L	Fundamentals of Biochemistry	4	4
Core Course-7 Practical	LS/ZOO/CC-303 P	Lab Course	2	4
Generic Elective-3 Theory	LS/ZOO/GE-301 L	Food Nutrition and Health	4	4
Generic Elective-3 Practical	LS/ZOO/GE-301 P	Lab Course	2	4
Skill Enhancement Course-1	LS/ZOO/SEC-301 L	Sericulture	2	4
Skill Enhancement Course-1	LS/ZOO/SEC-301 P	Lab Course	2	4
Total			28	34
Semester IV				
Core Course-8 Theory	LS/ZOO/CC-401 L	Comparative anatomy of vertebrates	4	4
Core Course-8 Practical	LS/ZOO/CC-401 P	Lab Course	2	4
Core Course-9 Theory	LS/ZOO/CC-402 L	Physiology: Life Sustaining Systems	4	4
Core Course-9 Practical	LS/ZOO/CC-402 P	Lab Course	2	4
Core Course-10 Theory	LS/ZOO/CC-403 L	Biochemistry of Metabolic Processes	4	4



Core Course-10 Practical	LS/ZOO/CC-403 P	Lab Course	2	4
Generic Elective-4 Theory	LS/ZOO/GE-401 L	Insect Vectors and Diseases	4	4
Generic Elective-4 Practical	LS/ZOO/GE-401 P	Lab Course	2	2
Skill Enhancement Course-2	LS/ZOO/SE-401	Medical Diagnostics	2	4
Skill Enhancement Course-2	LS/ZOO/SE-401	Lab Course	2	4
TOTAL			28	34
Summer Internship: 15 days			1	100
Swayam Swachhita / NSS / Industrial/ others			1	100
Semester V				
Core Course-11 Theory	LS/ZOO/CC-501 L	Molecular Biology	4	4
Core Course-11 Practical	LS/ZOO/CC-501 P	Lab Course	2	4
Core Course-12 Theory	LS/ZOO/CC-502 L	Principles of Genetics	4	4
Core Course-12 Practical	LS/ZOO/CC-502 P	Lab Course	2	4
Discipline Specific Elective-1 Theory	LS/ZOO/DSE-501(A) L LS/ZOO/DSE-501(B) L LS/ZOO/DSE-501(C) L	A. Basics of Neuroscience B. Endocrinology C. Immunology	4	4
Discipline Specific Elective-1 Practical	LS/ZOO/DSE-501(A) P LS/ZOO/DSE-501(B) P LS/ZOO/DSE-501(C) P	Lab Course A Lab Course B Lab Course C	2	4
Discipline Specific Elective-2 Theory	LS/ZOO/DSE-502(A) L LS/ZOO/DSE-502(B) L LS/ZOO/DSE-502(C) L	A. Animal Behavior and Chronobiology B. Parasitology C. Reproductive Biology	4	4
Discipline Specific Elective-2 Practical	LS/ZOO/DSE-502(A) P LS/ZOO/DSE-502(B) P LS/ZOO/DSE-502(C) P	Lab Course A Lab Course B Lab Course C	2	4
TOTAL			24	32
Semester VI				
Core Course-13 Theory	LS/ZOO/CC-601 L	Developmental Biology	4	4
Core Course-13 Practical	LS/ZOO/CC-601 P	Lab Course	2	4
Core Course-14 Theory	LS/ZOO/CC-602 L	Evolutionary Biology	4	4
Core Course-14 Practical	LS/ZOO/CC-602 P	Lab Course	2	4
Discipline Specific Elective-3 Theory	LS/ZOO/DSE-601(A) L LS/ZOO/DSE-601(B) L LS/ZOO/DSE-601(C) L	A. Biology of Insects B. Fish and Fisheries C. Wild Life Conservation and Management	4	4
Discipline Specific Elective-3 Practical	LS/ZOO/DSE-601(A) P LS/ZOO/DSE-601(B) P LS/ZOO/DSE-601(C) P	Lab Course A Lab Course B Lab Course C	2	4
Dissertation/ Project work/ Academic Visit followed by report submission and seminar	LS/ZOO/DW/PW/AV		5+1=6	8
TOTAL			34	32
TOTAL CREDITS			152 + 4 (SI)	

As per UGC CBCS guidelines, University / departments have liberty to offer GE and SEC courses offered by any department to students of other departments. The No. of GE course is four. One GE course is compulsory in first 4 semesters each. In present scheme it is proposed to have minimum two GE courses (from one subject) in first two semester after which student shall change two GE for another subject in IIIrd and IVth semester, so that all the student can have exposure of one additional subject.
(Subject to approval by the competent authority)

Changela External Expert
Dr. Rohit Seth 06/07/18
Santosh Singh Dr. Santosh Singh
Mouli Head of the Department
06/07/18

विभागाध्यक्ष
HEAD
जनपु विश्वविद्यालय
Department of Zoology
गुरु घासीदास विश्वविद्यालय, बिलासपुर
Guru Ghasidas Vishwavidyalaya, Bilaspur



Department of Zoology, School of Life Sciences, GGV, Bilaspur (CG)

CORE COURSE II

LS/ZOO/CC-102 L

PRINCIPLES OF ECOLOGY

THEORY

(Credits 4)

Unit 1: Introduction to Ecology	6
History of ecology; Autecology and synecology; Levels of organization; Laws of limiting factors-Liebig's law of minimum and Shelford's law of tolerance; Study of physical factors	
Unit 2: Ecosystem	12
Types of ecosystems with one example in detail; Trophic levels; Food chain: Detritus and grazing food chains, Linear and Y-shaped food chains; Food web; Energy flow through ecosystem; Ecological pyramids and Ecological efficiencies; Nutrient and biogeochemical cycle (nitrogen cycle); Human modified ecosystem	
Unit 3: Population	18
Unique and group attributes of population: Density, natality, mortality, life tables, fecundity tables, survivorship curves, age and sex ratio, dispersal and dispersion, Exponential and logistic growth, equation and patterns, r and k strategies; Population regulation-density-dependent and independent factors; Population interactions;	
Unit 4: Community	10
Community characteristics: species richness, dominance, diversity, abundance, vertical stratification, Ecotone and edge effect; Ecological Succession, Types of Succession, Theories pertaining to climax community	
Unit 5: Human impact on environment	10
Environmental Pollution: Air, water and noise pollution; Global environmental issues: Greenhouse effect, Acid rain, Global Warming, Ozone depletion.	
Unit 6: Applied Ecology	4
Ecology in Wildlife Conservation and Management	

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विभागाध्यक्ष
HEAD
जंतु विज्ञान विभाग
Department of Zoology
गुरु घासीदास विश्वविद्यालय, बिलासपुर
Bilaspur, Chhattisgarh, India-495009



Department of Zoology, School of Life Sciences, GGV, Bilaspur (CG)

GENERIC ELECTIVE COURSES

LE ZOO/GE-101 L

AQUATIC BIOLOGY

THEORY

(Credits 4)

UNIT 1: Aquatic Biomes

Brief introduction of the aquatic biomes: Freshwater ecosystem (lakes, wetlands, streams and rivers), estuaries, intertidal zones, oceanic pelagic zone, marine benthic zone and coral reefs.

UNIT 2: Freshwater Biology

Lakes: Origin and classification, Lake as an Ecosystem, Lake morphometry, Physico-chemical Characteristics: Light, Temperature, Thermal stratification, Dissolved Solids, Carbonate, Bicarbonates, Phosphates and Nitrates, Turbidity, dissolved gases (Oxygen, Carbon dioxide). Nutrient Cycles in Lakes-Nitrogen, Sulphur and Phosphorous.

Streams: Different stages of stream development, Physico-chemical environment, Adaptation of hill-stream fishes.

UNIT 3: Marine Biology

Salinity and density of Sea water, Continental shelf, Adaptations of deep sea organisms, Coral reefs, Sea weeds.

UNIT 4: Management of Aquatic Resources

Causes of pollution: Agricultural, Industrial, Sewage, Thermal and Oil spills, Eutrophication, Management and conservation (legislations), Sewage treatment Water quality assessment- BOD and COD.

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गुरु घासीदास विश्वविद्यालय
कोनी, बिलासपुर - 495009
Department of Zoology
गुरु घासीदास विश्वविद्यालय, बिलासपुर
495009

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Department of Zoology, School of Life Sciences, GGV, Bilaspur (CG)

GENERIC ELECTIVE COURSES

LS/ZOO/GE-201 L

ENVIRONMENT AND PUBLIC HEALTH

THEORY

(Credits 4)

Unit 1: Introduction

Sources of Environmental hazards, hazard identification and accounting, fate of toxic and persistent substances in the environment, dose Response Evaluation, exposure Assessment.

Unit 2: Climate Change

Greenhouse gases and global warming, Acid rain, Ozone layer destruction, Effect of climate change on public health.

Unit 3: Pollution

Air, water, noise pollution sources and effects, Pollution control.

Unit 4: Waste Management Technologies

Sources of waste, types and characteristics, Sewage disposal and its management, Solid waste disposal, Biomedical waste handling and disposal, Nuclear waste handling and disposal, Waste from thermal power plants, Case histories on Bhopal gas tragedy, Chernobyl disaster, Seveso disaster and Three Mile Island accident and their aftermath.

Unit 5: Diseases

Causes, symptoms and control of tuberculosis, Asthma, Cholera, Minamata disease, typhoid

Course Objective:

To understand the direct and indirect human, ecological and safety affects of major environmental and occupational agents.

Attain knowledge about genetic, physiologic and psychosocial factors that affect susceptibility to adverse health outcomes following exposure to environmental hazards.

Specify approaches for assessing, preventing and controlling environmental hazards that pose risks to human health and safety.

To understand various waste management techniques and risks involved in event of poor management.

Understand the outbreak of certain communicable and non-communicable diseases.

Course Outcomes:

Acquire skills in the application of epidemiologic methods to environmental health problems



Department of Zoology, School of Life Sciences, GGV, Bilaspur (CG)

GENERIC ELECTIVE COURSES

LS/ZOO/GE-201 P

ENVIRONMENT AND PUBLIC HEALTH

PRACTICALS

(Credits 2)

1. To determine Ph in soil and water samples from different locations.
2. To determine Cl in soil and water samples from different Locations
3. To determine SO₄ in soil and water samples from different Locations
4. To determine NO₃ in soil and water samples from different Locations
5. To determine BOD in water samples from different locations

SUGGESTED BOOKS

- Cutter, S.L. (1999) Environmental Risk and Hazards, Prentice-Hall of India Pvt. Ltd., New Delhi.
- Kolluru Rao, Bartell Steves, Pitblado R. and Stricoff (1996) "Risk Assessment and Management Handbook", McGraw Hill Inc., New York.
- Kofi Asante Duah (1998) "Risk Assessment in Environmental management", John Wiley and sons, Singapore.
- Kasperson, J.N. and Kasperson, R.E. and Kasperson, R.E. (2003) Global Environmental Risks, V.N. University Press, New York.
- Joseph F Louvar and B Diane Louvar (1997) Health and Environmental Risk Analysis fundamentals with applications, Prentice Hall, New Jersey.

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Department of Zoology, School of Life Sciences, GGV, Bilaspur (CG)

GENERIC ELECTIVE COURSES

LS/ZOO/GE-401 L

INSECT VECTORS AND DISEASES

THEORY

(Credits 4)

Unit I: Introduction to Insects 6
General Features of Insects, Morphological features, Head – Structure and orientation of Head, Eyes, Types of antennae, Mouth parts w.r.t. feeding habits. Outline classification of insects up to orders, detailed features of orders with insects as vectors- Diptera, Siphonaptera, Siphunculata, Hemiptera.

Unit II: Insect Vectors 14
Brief introduction of Carrier and Vectors (mechanical and biological vectors), Reservoirs, Host-pathogen interaction and relationship.

Unit III: Diptera as Disease Vectors 24
Dipterans as important insect vectors – Mosquitoes, Sand fly, Houseflies; Study of mosquito-borne diseases – Malaria, Dengue, Filariasis; Control of mosquitoes; Study of sand fly-borne diseases – Visceral Leishmaniasis, Phlebotomus fever; Control of Sand fly; Study of house fly as important mechanical vector, Myiasis, Control of house fly.

Unit IV: Siphonaptera as Disease Vectors 6
Fleas as important insect vectors; Host-specificity, Study of Flea-borne diseases – Plague, Typhus fever; Control of fleas.

Unit V: Siphunculata as Disease Vectors 4
Human louse (Head, Body and Pubic louse) as important insect vectors; Study of louse-borne diseases –Trench fever, Vagabond's disease, Control of human louse.

Unit VI: Hemiptera as Disease Vectors 6
Bugs as insect vectors; Blood-sucking bugs; Cimex Chagas disease, Bed bugs as mechanical vectors, Control and prevention measures.

Course Objective:

Insect vectors cause many diseases which lead to millions of deaths across the world especially in developing countries. The rate of pathogen spread by insects is increasing at an alarming pace posing a growing threat to the human population. Disease transmission by these insects can be prevented only by studying their biology, modes of transmission of pathogens by them, evaluation of associated risk factors, devise effective methods to control these insects and resolve the challenges posed.

Course outcomes

Describe the host-pathogen relationships and the role of the host reservoir on transmission of parasite. Explain control methods of insect vector diseases including preventing their spread, spreading awareness on public health programs and mitigating insect borne diseases. Employ the use of advanced management strategies in disease control with respect to parasite evolution.



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Semester V:

Course type	Course Code	Title of Course	Credits	Hrs/ Wk	Hrs/ Sem
Zoology (H)	ZOO-501	Economic Zoology	3	3	
	ZOO-502	Ecology and Evolution	3	3	
	ZOO-503	Lab Course (501 + 502)	3	6	
	ZOO-504	Biostatistics and Computer Applications	3	3	
Discipline Specific Elective - I (DSE-I)	ZOO-505 (A/B/C/D/E)	(Biochemistry/ Endocrinology/ Fish Biology/ Neuroscience/ Toxicology)	3	3	
	ZOO-506	Lab based on 504 and elective paper	3	6	
	ZOO-507	Seminar	3	3	
<i>Total Credits</i>			21		

Semester VI:

Course type	Course Code	Title of Course	Credits	Hrs/ Wk	Hrs/ Sem
Zoology (H)	ZOO-601	Microbiology and Parasitology	3	3	
	ZOO-602	Developmental Biology and Immunology	3	3	
	ZOO-603	Lab Course (601 + 602)	3	6	
	ZOO-604	Biotechniques	3	3	
Discipline Specific Elective - II (DSE-II)	ZOO-DSE-2 (A/B/C/D/E)	(Biochemistry/ Endocrinology/ Fish Biology/ Neuroscience/ Toxicology)	3	3	
	ZOO-DSE-3	Seminar on the basis of published research articles relevant to the topics covered in the elective paper	6	6	
<i>Total Credits</i>			21		

Note:

- Groups offered by the Department for Integrated UG/ PG students at entry level
 - Group I: Zoology, Chemistry and Botany (ZCB)
 - Group II: Zoology, Chemistry and Biotechnology (ZCBT)
- Codes of special papers
A= Biochemistry; B= Endocrinology; C= Fish Biology; D= Neuroscience; E= Toxicology.

Mouso
27/11/17
Head
Department of Zoology
G.G.V. Bilaspur (C.G.)

Ankur

Sandeep Singh
27/11/17



Department of Zoology, GGV, Bilaspur (CG)

B.Sc. (Hon'rs) Zoology SEMESTER - V

ZOO-CC: 501

ECONOMIC ZOOLOGY

(Credits- 02)

Unit 1: Aquaculture

(06 hrs)

Fish culture, Importance of fish and their by-products; Prawn culture; Pearl culture.

Unit 2: Sericulture

(06 hrs)

Species of silk worms, their host plants, and types of silk, Life cycle of silk worm, Mulberry silk worm culture; Appliances used in sericulture, Stifling, Disease.

Unit 3: Apiculture

(05 hrs)

Species of honey bees, Life history of honey bee, indigenous and modern techniques of apiculture, Bee products and their uses, Disease.

Unit 4: Lac culture

(04 hrs)

Morphology of Lac insect and its life cycle; Lac culture; Processing and uses of lac, Disease.

Unit 5: Animal husbandry and Poultry

(04 hrs)

Animal husbandry: Types of breeds of cows and buffaloes; Management of dairy animals.

Poultry: Types of breeds, Rearing methods, Diseases and control measures.

Books Recommended

1. Shukla and Upadhyaya : Economic Zoology (Rastogi Publishers, 1999-2000)
2. Shrivastava: Text book of Applied Entomology, Vol. I & II (Kalyani Publishers, 1991)
3. Mani: Insects, NBT, India, 2006.
4. Jabde: Text Book of Applied Zoology: Vermiculture, Apiculture, Sericulture, Lac culture, Agricultural Pests and their Control, 2005 Discovery Publishing House.
5. Jadhav U. Aquaculture Technology and Environment. PHI Learning, 2011.

Moulik
7/7/17
Head
Department of Zoology
Guru Ghasidas Vishwavidyalaya
Bilaspur (C.G.)
7/7/17

Anubom
Santosh Singh
2/2/17



Department of Zoology, GGV, Bilaspur (CG)

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B.Sc. (Hon'rs) Zoology SEMESTER - V

ZOO-CC: 502

ECOLOGY AND EVOLUTION

(Credits- 02)

Unit 1: Ecosystem

(05 hrs)

Components of ecosystems, Ecological factors a) Abiotic: temperature and light & their effects on organisms, b) Biotic- Intraspecific & interspecific associations; Food chain, Food pyramids, Energy flow in the ecosystem

Unit 2: Biodiversity and Conservation

(05 hrs)

Biodiversity concept, types of biodiversity, biodiversity and human welfare, mega diversity zones and biodiversity hot spots with special reference to India. Concept of conservation, *in situ* and *ex-situ* methods, Environmental degradation (natural and man-made), Pollution: types, sources and effects of major pollutants of air, water, soil and noise, Control of pollution

Unit 3: Population Ecology

(04 hrs)

Natality & mortality, growth forms, age pyramids, dispersal, distribution types, regulation of population density, Community ecology: Characteristics, types, habitat & niche concept.

Unit 4: Organic evolution

(05 hrs)

Concept of organic evolution, Evidences of organic evolution from comparative anatomy, embryology, palaeontology, biochemistry and genetics; theories of organic evolution: Lamarckism, Darwinism, modern synthetic theory, natural selection in action (industrial melanism, antibiotic and DDT resistance).

Unit 5: Population genetics

(05 hrs)

Gene frequency in Mendelian population, Hardy-Weinberg equilibrium; major evolutionary forces; isolating mechanisms, modes of speciation (allopatric and sympatric).

Books Recommended

1. Ecology: Principles & Applications' Chapman J.L. & Reiss M.J. (1995) Cambridge University Press 3)
2. Environmental Science: A Global Concern' Cunningham W.P. & Saigo S.W. (1997) WCB, McGraw Hill 4)
3. Environmental Science Tyler M.G. Jr. (1997) Wadsworth Publ. Co.
4. Environmental Studies Benny Joseph (2005) Tata McGraw Hill Publ. Co. Ltd.
5. Heywood, V.H. and Watson, R.T. Global Biodiversity Assessment. UNEP - Cambridge.
6. Gadgil, M., Ghate, U and Pramod, P. Biodiversity. Resource Material for Courses, Practical Exercises and student projects at college and universities.

Evolution

1. P A Moody: Introduction to Evolution;
2. Rastogi: Organic Evolution (2007, Kedarnath & Ramnath)
3. Strickberger: Evolution

Mouso
2/7/17
Head
Department of Zoology
Guru Ghasidas Vishwavidyalaya
Bilaspur (C.G.)
S.P. B. J.
2/7/17

Ana hru.
Sankar Singh
2/7/17



Department of Zoology, GGV, Bilaspur (C.G.)

DSE III: TOXICOLOGY

Unit 1: Xenobiotics and its life cycle; Membrane permeability and mechanism of chemical transfer; Absorption and translocation of xenobiotics; Membrane barriers: Blood-Brain barriers, Placental barriers, Blood-Testes barrier, Blood-Urine barrier, Blood-Bile barrier; Routes of excretion of xenobiotics.

Unit 2: Biotransformation of Xenobiotics: Type of biotransformation: Phase I and Phase II reactions; Biotransformation of pesticide (DDT).

Unit 3: Biomonitoring: Definition and objectives; Biological Monitoring Program; Parameters of Biomonitoring; Bioindicators and Environmental Monitoring; Application of Bioassay in Toxicology.

Unit 4: Aquatic toxicology: toxicants, factors and effects; Bioaccumulation and Biomagnifications in aquatic organisms; Bioassay study; Aquatic pollution and toxicity: Types and sources of pollutants.

Unit 5: Methods of assessment of aquatic pollution; Biological indicators of pollution; Drinking water treatment and Disposal of sewage.

Books Recommended

1. Cassarett and Doull's Toxicology "The Basic Science of The Poisons" 7th edition (2008).
2. Curtis D. Klaassen Editor, McGrawHill Medical. ISBN: 9780071470513.
3. Cassarett and Doull's "Essentials of Toxicology" 2nd edition (2010), Klaassen and Whatkins, McGraw Hill Publisher. ISBN-13: 978-0071622400.
4. Introduction to Toxicology, 3rd edition (2001), John Timbrell, Taylor and Francis Publishers. ISBN 13: 9780415247627.
5. Principles of Toxicology, 2nd edition (2006), Sime Karen and Thomas M Brown, CRC press. ISBN-13: 978-0849328565.
6. Lu's basic toxicology: Fundamentals target organ and risk assessment, 5th edition (2009).
7. Frank C. Lu and Sam Kacow, Informa Health care. ISBN: 9781420093117.

DISSERTATION/ PROJECT WORK

Mouib
7/7/17
Head
Department of Zoology
Guru Ghasidas Vishwavidyalaya
Bilaspur (C.G.)

Soni
7/7/17

Anabam
09/07/17

Sanjay S. 22/8
21/07/12