



# दिल्ली विश्वविद्यालय University of Delhi

परिषद् शाखा - II, कमरा नं: 211, नया प्रशासनिक खंड, दिल्ली विश्वविद्यालय, दिल्ली-110007, दूरभाष: 011-27001156/54  
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CNC-II/093/1/AC-1027/26/2

Dated: 27.07.2026

## **NOTIFICATION**

Sub: Amendment to Ordinance V

(AC dated 24.07.2026)

Following addition be made to Annexure-II-A to the Ordinance V (2-A) of the Ordinances of the University;

### **Add the following:**

The following syllabi of the Department of Anthropology under the Faculty of Science based on Postgraduate Curriculum Framework 2024 are notified herewith for the information of all concerned:

| Department   | Syllabi                                                                                                                                                                        | Annexure |
|--------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|
| Anthropology | (i) Two-Year M.Sc. Anthropology (Semester III/IV) and One-Year M.Sc. Anthropology (Semester I/II).<br>(ii) Two-Year M.Sc. Forensic Science (Semester III/IV) (Structure-I/II). | 1 & 2    |

  
**REGISTRAR**

**Curriculum Structure of 2nd Year of PG for Two years PG Programme (3+2) OR**

**One Year PG Programme After Completion of Four-Year UG Programme (4+1)**

**Annexure-I**

**Structure-1 (Level-6.5): PG Curriculum Structure with only Course Work**

| Level-6.5                                                                        | Year-2             |                                                                   |                                                     |         |  | Year-2                                                                           |                                                                   |                                                        |    |
|----------------------------------------------------------------------------------|--------------------|-------------------------------------------------------------------|-----------------------------------------------------|---------|--|----------------------------------------------------------------------------------|-------------------------------------------------------------------|--------------------------------------------------------|----|
|                                                                                  |                    |                                                                   | Paper                                               | Credits |  |                                                                                  | Paper                                                             | Credits                                                |    |
|                                                                                  | <b>Semester.-3</b> | DSC-7                                                             | Fieldwork Tradition in Anthropology                 | 4       |  | <b>Semester.-4</b>                                                               | DSC-9                                                             | Palaeoanthropology                                     | 4  |
|                                                                                  |                    | DSC-8                                                             | Primateology                                        | 4       |  |                                                                                  | DSC-10                                                            | Tribal India                                           | 4  |
|                                                                                  |                    |                                                                   |                                                     | 8       |  |                                                                                  |                                                                   |                                                        | 8  |
|                                                                                  |                    |                                                                   |                                                     |         |  |                                                                                  |                                                                   |                                                        |    |
| Students can OPT for either 3 New DSEs, OR 2 New DSEs & 1 GE from the list below |                    |                                                                   |                                                     |         |  | Students can OPT for either 3 New DSEs, OR 2 New DSEs & 1 GE from the list below |                                                                   |                                                        |    |
|                                                                                  |                    | DSE-5                                                             | Molecular Anthropology                              | 4       |  |                                                                                  | DSE-14                                                            | Anthropology of Public Policy                          | 4  |
|                                                                                  |                    | DSE-6                                                             | Physiological Anthropology                          |         |  |                                                                                  | DSE-15                                                            | Kinanthropology                                        |    |
|                                                                                  |                    | DSE-7                                                             | Anthropology of Religion                            |         |  |                                                                                  | DSE-16                                                            | Psychological Anthropology                             |    |
|                                                                                  |                    | DSE-8                                                             | Anthropology of Gender                              |         |  |                                                                                  | DSE-17                                                            | Genetic Epidomology                                    |    |
|                                                                                  |                    | DSE-9                                                             | Linguistic Anthropology                             |         |  |                                                                                  | DSE-18                                                            | Medical Anthropology                                   |    |
|                                                                                  |                    | DSE-10                                                            | Economic Anthropology                               |         |  |                                                                                  | DSE-19                                                            | Anthropological perspective on Indian Knowledge System |    |
|                                                                                  |                    | DSE-11                                                            | Political Anthropology                              |         |  |                                                                                  | DSE-20                                                            | Environmental Health                                   |    |
|                                                                                  |                    | DSE-12                                                            | Anthroplogy of Development                          |         |  |                                                                                  | DSE-21                                                            | Field based Project                                    |    |
|                                                                                  |                    |                                                                   |                                                     |         |  |                                                                                  |                                                                   |                                                        |    |
|                                                                                  |                    |                                                                   |                                                     |         |  |                                                                                  |                                                                   |                                                        |    |
|                                                                                  |                    | GE-3                                                              | Indian Prehistory                                   | 4       |  |                                                                                  | GE-5                                                              | Anthropology of Cultural Heritage                      | 4  |
|                                                                                  |                    | GE-4                                                              | Anthropology of North East India                    |         |  |                                                                                  | GE-6                                                              | Society and Culture in Vedic Times                     |    |
|                                                                                  |                    |                                                                   |                                                     |         |  |                                                                                  |                                                                   |                                                        |    |
|                                                                                  |                    |                                                                   |                                                     |         |  |                                                                                  |                                                                   |                                                        |    |
|                                                                                  |                    | Either one of the two                                             | If 3 DSE (4 Credicts each)                          | 12      |  |                                                                                  | Either one of the two                                             | If 3 DSE (4 Credicts each)                             | 12 |
|                                                                                  |                    |                                                                   | If 2 DSE (4 Credicts each) + 1GE (4 credit)         |         |  |                                                                                  |                                                                   | If 2 DSE (4 Credicts each) + 1GE (4 credit)            |    |
|                                                                                  |                    | One Skill Based/Workshop/Specialized Laboratory/Hands on Learning |                                                     |         |  |                                                                                  | One Skill Based/Workshop/Specialized Laboratory/Hands on Learning |                                                        |    |
|                                                                                  |                    |                                                                   |                                                     |         |  |                                                                                  |                                                                   |                                                        |    |
|                                                                                  |                    | SEC-1                                                             | Participatory research and Social Impact assessment | 2       |  |                                                                                  | SEC-3                                                             | Anthropology of Tourism                                | 2  |
|                                                                                  |                    | SEC-2                                                             | Ergonomic Anthropology                              |         |  |                                                                                  | SEC-4                                                             | One Health                                             |    |

## Semester III

### Discipline Specific Core (DSC-7)

#### Fieldwork Tradition in Anthropology

| Course Title                        | Total Credit | Credit distribution |           |
|-------------------------------------|--------------|---------------------|-----------|
| Fieldwork Tradition in Anthropology | 04           | Theory              | Practical |
|                                     |              | 03                  | 01        |

**Total Teaching Hours:** Theory – 45 hours (3 hours/week); Practical – 30 hours (2 hours/week)

#### Introduction

Fieldwork is central to anthropology, marked by immersive engagement with communities. This course reviews the development of fieldwork from early ethnography to current practices, especially in India. Students will study foundational works and new approaches while gaining both theoretical and practical skills for independent research.

#### Course Objectives

- Introduce the genesis and history of anthropological fieldwork, with a focus on India.
- Analyze contributions from pioneering anthropologists on fieldwork tradition
- Highlight ethical, epistemological, and practical challenges of fieldwork in diverse cultural settings.
- Guide students in designing and performing small-scale fieldwork exercises.

#### Learning Outcomes

By course end, students will:

- Explain the evolution and relevance of fieldwork in anthropology.
- Apply suitable fieldwork methods in varied social contexts.
- Critically evaluate ethnographic studies and their theoretical significance.
- Recognize and address ethical concerns in field research.
- Plan and conduct basic fieldwork and present the findings systematically in the form of a report.

**Keywords:** Participant observation, Ethnography, Intensive fieldwork, Village and Tribal ethnography, Urban setting, Reflexivity, Research ethics, Field diary, Rapport, Multi-sited ethnography, Decolonizing methodology

#### Syllabus (Theory)

##### Unit I: Historical Foundations of Fieldwork Tradition

Emergence of fieldwork tradition in anthropology: Armchair anthropology, Torres Strait and Baffinland expedition. Early Indian Fieldwork tradition. The colonial census, Gazetteers, and the formative works of S.C. Roy (Monographic approach) and L.K. Ananthakrishna Iyer (Encyclopedic approach). Growth fieldwork in India D.N. Majumdar, M.N. Srinivas, S.C. Dube and others. Fieldworker and the Field: Challenges of caste, kinship, gender, and power dynamics in fieldwork; insider-outsider perspectives. **11 hours**

**Unit II Fieldwork in cross-cultural Context** Tribal fieldwork traditions: issues of isolation, integration, and rights, Rural/village studies India: Restudies”; caste, jajmani, dominance, and change. Fieldwork in urban slums, cities, migrant communities, and industrial settings. Studies of ethnicity, class, and **11 hours**

### **Unit III: Fieldwork, Ethics and Emerging Trends**

Malinowskian Diary and Post-modern turn in Fieldwork. Reflexivity, positionality, and decolonizing fieldwork; reciprocity, power relations, representation, and “Challenges in the field: Safety, Gender issues and Political sensitivities. New directions in Fieldwork: Digital ethnography, sensory methods, and public anthropology in India. **12 hours**

### **Unit IV: Fieldwork and Theory**

Scientific Treaties (Malinowski and Radcliffe-Brown), Historiographic accords (Evans-Prichard), Actor Center and Processual approaches, Meaning centered, literary, interpretive turn: Clifford Geertz; Victor Turner and Mary Douglas **11 hours**

#### **Practical: (1 Credit – 30 hours)**

The practical component aims to provide hands-on training in fieldwork skills. Students will undertake supervised short-term fieldwork (individual or group) in a nearby rural/tribal/urban community (preferably in Delhi-NCR or during study tours).

#### **Activities:**

- Preparation of a field research proposal (including ethics clearance simulation).
- Participant observation and field note writing (minimum 7–10 days of immersion).
- Collection of genealogies, social mapping, and at least one life history/case study.
- Maintenance of a reflective field diary.
- Data organization, preliminary analysis, and presentation of a short field report (written + seminar).
- Training in basic tools: Photography, audio recording (with consent), and simple coding of qualitative data.

**Evaluation:** Field report (50%), Viva-voce (25%), Class participation & diary (25%).

#### **Suggested Readings**

1. **Béteille, A., & Madan, T.N. (Eds.). (1979).** *Encounter and Experience: Personal Accounts of Fieldwork*. Vikas Publishing.
2. **Furer-Haimendorf, C. von and Verrier Elwin** (Various works on Indian tribes).
3. **Gupta, A., & Ferguson, J. (Eds.). (1997).** *Anthropological Locations: Boundaries and Grounds of a Field Science*. University of California Press.
4. **Levi-Sanchez, S. (2026).** *Fieldwork as craftwork: A practical guide for conducting research in the real world*. Bloomsbury Publishing.
5. **Majumdar, D.N. (1958).** *Caste and Communication in an Indian Village*. Asia Publishing House.
6. **Malinowski, B. (1922).** *Argonauts of the Western Pacific*. Routledge.

7. **Malinowski, B.** *A Diary in the Strict Sense of the Term*. Translated by Norbert Guterman. Stanford: Stanford University Press, 1989. First published 1967 by Harcourt, Brace & World
8. **Srinivas, M.N. (1976).** *The Remembered Village*. Oxford University Press.
9. **Srinivas, M. N., Shah, A. M., & Ramaswamy, E. A. (Eds.). (2002).** *The fieldworker and the field: Problems and challenges in sociological investigation* (2nd ed.). Oxford University Press.
10. **Srivastava, V.K. (Ed.). (2004).** *Methodology and Fieldwork*. Oxford University Press.
11. **Additional readings:** Works by S.C. Dube, Oscar Lewis (restudy), Breman, Parry, and contemporary urban ethnographers like Sanjay Srivastava (*Entangled Urbanism*)

**Semester-III**  
**Discipline Specific Core (DSC-8)**  
**Primatology**

| Course Title and Code | Total Credits | Lecture | Practical | Tutorial | Eligibility                          |
|-----------------------|---------------|---------|-----------|----------|--------------------------------------|
| Primatology           | 04            | 03      | 01        | 0        | UG in Anthropology/<br>Life Sciences |

**Primatology** occupies a foundational position in biological anthropology, providing systematic and comparative knowledge of our closest living relatives and an indispensable evolutionary framework for understanding the origins of human sociality, cognition, and behaviour. This course offers an advanced, integrative treatment of primate behavioural ecology, social organisation, cognition, communication, and conservation biology. A sustained emphasis on South Asian and Indian primates, one of the most diverse primate assemblages in the world, runs throughout the course, and students are introduced to the ethnoprimate traditions, human-primate interface issues, and wildlife conservation frameworks specific to the Indian context, including relevant perspectives from Indian Knowledge Systems.

### **COURSE OBJECTIVES**

1. To provide an advanced understanding of primate social organisation, behavioural ecology, and life history variation, situating these within rigorous evolutionary and socioecological theoretical frameworks.
2. To develop critical engagement with contemporary research on primate cognition, communication, and cultural transmission, and to assess their implications for understanding human behavioural evolution.
3. To examine the conservation challenges facing non-human primates, with particular reference to Indian and South Asian species, and to explore the intersections of ethnoprimate, human-wildlife conflict, and the One Health framework.

### **LEARNING OUTCOMES**

By the end of this course, students will be able to:

1. Apply socioecological models and evolutionary theory to explain variation in primate social systems, mating strategies, and life history parameters across major taxonomic groups, with particular reference to Indian primates.
2. Critically evaluate empirical and theoretical research on primate cognition, communication, and social learning, and assess the comparative relevance of primate data for understanding human behavioural evolution.
3. Design and execute a structured behavioural observation study using standard field methodology, including focal animal sampling, scan sampling, and ethogram construction, and analyse and report on observational data systematically.
4. Assess the conservation status of Indian primate species, engage with ethnoprimate perspectives and primates in Indian cultural and Knowledge System traditions, and critically analyse the dynamics of human-primate coexistence.

### **COURSE CONTENT**

**Unit I: Primate Ecology, Morphology, and Diversity****12 hours**

History and scope of primatology; key contributors including Solly Zuckerman, C. Ray Carpenter, Jane Goodall, Dian Fossey, Birutė Galdikas, and P. K. Seth. Taxonomy of primates: Strepsirrhini, Haplorrhini, Platyrrhini, Catarrhini, and major families. Morphological adaptations: dentition, locomotion, sensory systems. Dietary ecology: feeding strategies and digestive adaptations. Habitat ecology: ranging, activity, niche use. Distribution, diversity, and conservation status of Indian primates.

**Unit II: Primate Social Organisation and Behavioural Ecology****12 hours**

Socioecological models and their theoretical lineage, linking food distribution with female spatial organisation and male mating strategies. Primate social systems, including solitary, pair-bonded, uni-male polygynous, multi-male multi-female, fission-fusion, and multi-level societies, with Indian and global case studies. Female strategies: contest and scramble competition, dominance hierarchies, matrilineal kinship, allomothering, and cooperative care. Male strategies: competition, coalitions, rank acquisition, infanticide, counter-strategies, and male-female bonds. Sexual selection: mate choice, dimorphism, sperm competition, extra-pair copulations. Life history traits: growth, reproduction, senescence, trade-offs. Dispersal patterns: natal dispersal, philopatry, sex bias, kin competition, and nepotism.

**Unit III: Primate Cognition and Communication****11 hours**

Theoretical frameworks for primate intelligence, including Social Brain and ecological models. Primate archaeology: culture, cognition, and adaptation; tool use and material culture, such as chimpanzee nut-cracking and termite-fishing traditions, and stone tool use in macaques and capuchins. Primate communication: vocal, visual, olfactory, and tactile systems. Ape language research: American Sign Language and Lexigram Studies (Case Studies: Washoe; Koko). Social learning, cultural transmission, and primate self-awareness, metacognition, and prospective cognition. Stone tool knapping behaviour and toolkit production in primates, with experimental evidence from Kanzi demonstrating lithic-making abilities.

**Unit IV: Conservation Biology and Ethnoprimateology****10 hours**

Global and Indian conservation status of non-human primates, including IUCN Red List assessments and major threats such as deforestation, agriculture, hunting, trade, climate change, and disease. Ethnoprimateology and human-primate interfaces; primates in Indian Knowledge Systems, cultural traditions, and ritual ecology, including temple macaques, commensalism, taboos, and folk knowledge. Human-wildlife conflict, crop raiding, and mitigation; urban macaques. Zoonotic diseases, the One Health framework, and the ethics of primate research, including field and captive guidelines.

**PRACTICAL****30 hours**

1. **Indian Primate Identification Exercise:** Identification of 25 Indian primate species from specimen photographs, diagnostic pelage characteristics, dental formulae, and morphological traits; preparation of annotated species data sheets including habitat, distribution, diet, and IUCN status.

2. **Non-human Primate Osteology:** Identification, labelling, and comparative measurement of primate skeletal specimens: cranium, mandible, dentition, femur, humerus, and pelvis, against human specimens; tabulation of key morphological differences and discussion of their functional and evolutionary significance.
3. **Ethogram Construction and Video-based Behavioural Sampling:** Using documentary footage of non-human primate species, students (a) construct a standardised, mutually exclusive and exhaustive ethogram for a selected species; (b) conduct focal animal sampling and instantaneous scan sampling on video sequences; (c) compute inter-observer reliability coefficients (Cohen's Kappa); and (d) produce a brief written analysis of the resulting behavioural data.
4. **Field Observation at a Zoological Park or Wildlife Sanctuary** (e.g., *National Zoological Park, Delhi*): Students collect structured behavioural data on a target primate species over a minimum of three hours using a pre-designed ethogram and approved sampling protocol. A field data report of not more than 1500 words, including methods, results, and discussion, is submitted for evaluation.
5. **Conservation Mapping and Status Assessment:** Using IUCN Red List, Wildlife Institute of India, and National Biodiversity Authority databases, students map the distribution, threat category, and Protected Area coverage of Indian primate species; findings are presented as an annotated map with a written commentary analysing the major threats and conservation gaps for two selected species.

### Core Readings

1. Strier, K. B. (2017). *Primate Behavioral Ecology* (5th ed.). Routledge/Pearson.
2. Fleagle, J. G. (2013). *Primate Adaptation and Evolution* (3rd ed.). Elsevier Academic Press.
3. van Schaik, C. P. (2016). *The Primate Origins of Human Nature*. Wiley-Blackwell.
4. Campbell, C. J., Fuentes, A., MacKinnon, K. C., Bearder, S. K., & Stumpf, R. M. (eds.) (2011). *Primates in Perspective* (2nd ed.). Oxford University Press.
5. Fuentes, A. (ed.) (2017). *The International Encyclopedia of Primatology*. John Wiley & Sons.
6. Setchell JM, Curtis DJ, eds. *Field and Laboratory Methods in Primatology: A Practical Guide*. 2nd ed. Cambridge University Press; 2011.

### Suggested Readings

1. Mitani, J. C., Call, J., Kappeler, P. M., Palombit, R. A., & Silk, J. B. (eds.) (2012). *The Evolution of Primate Societies*. University of Chicago Press.
2. Janson, C. (2000). Primate socio-ecology: The end of a golden age. *Evolutionary Anthropology*, 9(2): 73-86.
3. Fuentes, A. (2010). Natural cultural encounters in Bali: Monkeys, temples, tourists, and ethnoprimateology. *Cultural Anthropology*, 25(4): 600-624.
4. Shumaker, R. W., Walkup, K. R., & Beck, B. B. (2024). *Animal tool behavior: the use and manufacture of tools by animals*. JHU Press.

**Note:** Additional readings will be given based on specific case studies and lecture topics during the course.

### TEACHING LEARNING PROCESS

1. Classroom lectures supported by multimedia resources, including documentary footage, field photographs, and species identification materials.

2. Seminars and structured discussions drawing on current research from the *American Journal of Primatology*, *International Journal of Primatology*, *Primates*, and *Folia Primatologica*.
3. Structured practical sessions combining laboratory osteology, video-based ethogram training, and conservation data mapping using IUCN and WII databases.
4. Field visit to a zoological park or wildlife sanctuary for direct behavioural observation and structured data collection.
5. Student presentations on assigned Indian primate species or conservation case studies, integrating library research and secondary data.

## **ASSESSMENT METHODS**

Theory Examination and Continuous Assessment through practicals, field data report, conservation mapping exercise, and seminar participation.

**Keywords:** *Primatology, Socioecology, Primate Behaviour, Ethnoprimateology, Indian Primates, Conservation Biology, Primate Cognition, Behavioural Field Methods, South Asian Primates, Monkey, Ape*

**Semester-III**  
**DISCIPLINE SPECIFIC ELECTIVES (DSE-5)**  
**Molecular Anthropology**

| Course Title and Code         | Total Credits | Credit distribution of the course |           |
|-------------------------------|---------------|-----------------------------------|-----------|
|                               |               | Lecture                           | Practical |
| <b>Molecular Anthropology</b> | <b>04</b>     | <b>03</b>                         | <b>01</b> |

**Course Objectives**

1. To learn basic tenets of molecular anthropology and its applications
2. To understand the genetic structure of human populations based on molecular markers.
3. To learn the types of DNA markers and their utility in genetic analysis.
4. To learn the methods and approaches in ancient DNA research and its limitations.

**Learning Outcomes**

Students will be able to

1. Understand the concepts and terminology used in molecular anthropology
2. Understand the relevance of molecular markers in studying human origin and peopling of India and other populations
3. Learn the methods and techniques used in genetic data generation
4. Appreciate the importance of genetic databases in understanding societies of the past.

**UNIT-I:** Macro and Micro evolution, Concept of molecular evolution, rate of molecular evolution, gene functions, and phenotypic evolution. Human Phylogenetics; Tree reconstruction methods; Applications of phylogenetic studies; Role of culture in shaping human genetic variation. Softwares for molecular genetic analysis. Applications of phylogenetic studies. **12 Hours**

**UNIT-II:** Out of Africa Hypothesis; Human Origin: Mitochondrial Eve Hypothesis and its Critical assessment, Haplotypes and Haplogroups, Models of Human origin and migration based on mtDNA and Y-chromosomal markers and Phylogeography: Peopling of India and world populations. Genetic structure of Indian tribal populations. Population structure in India other genetic isolates. **12 Hours**

**UNIT-III:** Classical markers, DNA markers: Restriction fragment length polymorphisms; Polymerase chain reaction; Genotyping and Sequencing Techniques: Single gene, Multiple genes, Whole genome sequencing methods. Population Structure, Multidimensional scaling, principal components analysis. Genome-India Project **11 Hours**

**UNIT-IV:** Ancient DNA technology: Concepts, Methods and Techniques. Inferences from studies on ancient DNA technology. Examples of Ancient DNA studies and limitations of ancient DNA research. Genetic origin of Indo-European languages and its debate. Indian Ancient DNA research: Roopkund and Rakhigrahi. Critical assessment of Aryan-Invasion debate **10 Hours**

**Practical**

**30 Hours**

Practical (Molecular Anthropology):

- a. DNA Extraction
- b. DNA Quantification
- c. DNA Amplification: Polymerase chain reaction
- d. Electrophoresis
- e. Genotyping and sequencing Techniques

**Keywords:** Human phylogenetics, mt DNA, Y chromosomal region, DNA sequencing

**Core Readings**

1. Nei and Kumar. Molecular Evolution and Phylogenetics. (2000)
2. Vogel F. and Motulsky A.G. (2010). Human Genetics: Problems and Approaches. Springer, 3rd revised edition
3. Patrick F. Chinnery, Hans-Jürgen Bandelt, Vincent Macaulay, Martin Richards (eds.). Human Mitochondrial DNA and the Evolution of Homo sapiens. (2006), Springer-Verlag Berlin Heidelberg
4. Jobling, MA Hurles, M and Tyler-Smith, C (2004). Human Evolutionary Genetics, Origins, Peoples and Disease. Garland Science, New York.
5. Chaubey G., Kadian A., Bala S., V. R. Rao. Genetic Affinity of the Bhil, Kol and Gond Mentioned in Epic Ramayana. PLOS ONE 10(7): e0134200.

**Suggested Readings**

1. Loh, P. R., et al. (2016). *Local ancestry in admixed populations*. *Genetics*, 192(4), 1515-1530.
2. Cummings MR (2011). Human Heredity: Principles and Issues. Brooks/Cole, Cengage Learning
3. Reece, RJ (2004). Analysis of Genes and Genomes. John Wiley and Sons Ltd, England.
4. Strachan, T and Read, AP (2020). Human Molecular Genetics. Garland Publishing Inc, New York

**Semester-III**  
**DISCIPLINE SPECIFIC ELECTIVES (DSE-6)**  
**Physiological Anthropology**

| Course Title and Code      | Total Credits | Credit distribution of the course |           |
|----------------------------|---------------|-----------------------------------|-----------|
|                            |               | Lecture                           | Practical |
| Physiological Anthropology | 04            | 03                                | 01        |

**Course Objective**

1. To understand the fundamentals of physiological anthropology
2. To understand the concept of physical performance, physiological adaptation and factors influencing adaptation.
3. To learn the relationship between physique and human body composition

**Course Learning Outcomes**

1. Student should understand the fundamentals of physiological anthropology
2. Should understand the concept of physical performance, physiological adaptation and factors influencing adaptation.
3. Student will learn the relationship between physique and human body composition

**Unit 1** Fundamentals of work physiology- homeostasis; metabolism and energy and systems; exercise, respiratory system and haemodynamics (blood pressure, pulse, rate, heart rate, heamatocrit, etc)  
**12 Hours**

**Unit 2** Acute physiological adjustments during transition from resting homeostasis to sub-maximal and maximal exercise and physiological adaptations  
**12 Hours**

**Unit 3** Cardio-vascular and respiratory endurance, physical working capacity and physical fitness; Reproductive health, regulation of metabolism, growth and energy balance  
**11 Hours**

**Unit 4** Physical performance and environmental stress; inter-relationship between physique, body composition and nutrition  
**10 Hours**

**Practical**  
**30 Hours**

1. Cardiovascular function
  - Blood pressure using sphygmomanometer and stethoscope
  - Heart rate
  - Pulse rate
2. Respiratory functions (Static and Dynamic lung functions)
3. Physical activity assessment

## **Suggested readings**

### **Unit 1**

Fundamentals of work physiology- homeostasis; metabolism and energy and systems- Exercise Physiology Energy , Nutrition and Human Performance by McArdle , Katch and Katch .Chapter 24(Page 334-341)

Exercise, respiratory system and haemodynamics (blood pressure, pulse, rate, heart rate, heamatocrit, etc) – Exercise Physiology Energy , Nutrition and Human Performance by McArdle , Katch and Katch . Chapter 12(Page 154-167), Chapter 13(Page 168-179) and Chapter 14(Page 180-196)

### **Unit 2**

Acute physiological adjustments during transition from resting homeostasis to submaximal and maximal exercise and physiological adaptations- Exercise Physiology Energy , Nutrition and Human Performance by McArdle , Katch and Katch . Chapter 23(Page 322-333) and Chapter 24(Page 334-353)

### **Unit 3**

Cardio-vascular and respiratory endurance- Exercise Physiology Energy , Nutrition and Human Performance by McArdle , Katch and Katch . Chapter 15(Page 197-209) , Chapter 16(Page 210-218) and Chapter 17(Page 219-233)

Physical working capacity and physical fitness; relationship of body measurements with cardio-vascular and respiratory functions- Physical Activity and Health by C. Bouchard, S.N Blair, W.L Haskell Chapter 3(Page 37-42)

### **Unit 4**

Physical performance and environmental stress; inter-relationship between physique, body composition and nutrition. Exercise Physiology Energy , Nutrition and Human Performance by McArdle , Katch and Katch . Chapter 23(Page 322-333) ,Chapter 26(Page 368-391) and Chapter 27(Page 392-404)

**Semester-III**  
**DISCIPLINE SPECIFIC ELECTIVES (DSE-7)**  
**Anthropology of Religion**

| Course Title and Code           | Total Credits | Credit Distribution of the Course |           | Tutorial | Eligibility |
|---------------------------------|---------------|-----------------------------------|-----------|----------|-------------|
|                                 |               | Lecture                           | Practical |          |             |
| <b>Anthropology of Religion</b> | 04            | 03                                | 01        | 0        | PG I        |

**Course Objectives**

1. The present course introduces students to the study of religion as a social phenomenon and a social institution. It aims to encourage students to explore the meaning and essence of religion as an anthropological category, thereby exposing them to the diversity of religious life in a global world order.
2. The course further prepares students to engage with religion in everyday life with a sense of responsibility and to examine its practical links with political, economic, and environmental spheres.
3. It also encourages students to revisit Indian traditions and historical roots by exploring eastern religions such as Hinduism and Buddhism as important foundations of the Indian knowledge system.

**Learning Outcomes**

1. Students will understand the definitional boundaries, theoretical approaches, and methodologies used in the anthropological study of religion in society.
2. Students will be able to examine the construction of religious identities through language, ideology, narratives, and discourse in Indian contexts.
3. Students will understand the relevance of religion and spirituality in medical science and environmental conservation, reflecting the role of religion in the Indian knowledge system.

**Course Content**

**Unit I** —Definitions, theories, and key concepts: supernatural, sacred/profane, totem, magic, rituals, myth, witchcraft and sorcery, rites of passage, and religious specialists. **10 Hours**

**Unit II** — Religion and social dimensions: identity, gender, and environment; religious symbolism and power; world religions and lived religions; economics of religion. **12 Hours**

**Unit III** — Folk and tribal religions; pilgrimage and religious tourism in India; great traditions and little traditions in the Indian context; Indian knowledge systems. **12 Hours**

**Unit IV** — Religious movements and social change; pluralism and secularism; revivalism and conversion; religion, modernity, and globalization. **11 Hours**

**Practical** **30 Hours**

**1. Book Review**

Critical review of an ethnography or monograph on religion, focusing on research questions, methodology, theoretical framework, and key arguments.

**2. Research Design, Fieldwork, and Report Writing**

Formulate a research proposal on a selected theme, conduct short-term fieldwork using appropriate research methods, and prepare and submit a research report.

### **Core Readings**

- Eller, J. D. (2007). *Introducing anthropology of religion: Culture to the ultimate*. Routledge.
- Madan, T. N. (2011). *India's religions: Perspectives from sociology and history* (2nd ed.). Oxford University Press.
- Srinivas, M. N. (1952). *Religion and society among the Coorgs of South India*. Oxford University Press.
- Vidyarthi, L. P. (1961). *The sacred complex in Hindu Gaya*. Asia Publishing House.

### **Suggested Readings**

- Evans-Pritchard, E. E. (1940). *The Nuer: A description of the modes of livelihood and political institutions of a Nilotic people*. Clarendon Press.
- Evans-Pritchard, E. E. (1976). *Witchcraft, oracles and magic among the Azande* (E. Gillies, Ed.; Abridged ed.). Oxford University Press. (Original work published 1937).
- Hobgood, L., & Bauman, W. (Eds.). (2018). *The Bloomsbury handbook of religion and nature: The elements*. Bloomsbury Academic.
- McGuire, M. B. (2008). *Lived religion: Faith and practice in everyday life*. Oxford University Press.
- Turner, E. (2005). *Among the healers: Stories of spiritual and ritual healing around the world*. Praeger.

### **Teaching-Learning Process**

- Classroom Lecture
- Interactive group discussions
- Blackboard and PPT classroom presentations

### **Assessment Methods**

- Written assignment
- Power point presentation by students
- Class test

**Keywords:** Religion, supernatural, sacred, ritual, symbol, identity, power, pluralism, religious movements, secularism, globalization, modernity

**Semester-III**  
**DISCIPLINE SPECIFIC ELECTIVES (DSE-8)**  
**Anthropology of Gender**

| Course Title and Code  | Total Credits | Credit Distribution of the Course |          |
|------------------------|---------------|-----------------------------------|----------|
| Anthropology of Gender | 4             | Lecture                           | Tutorial |
|                        |               | 3                                 | 1        |

**Course objectives**

1. To encourage students to critically deliberate and discuss on the existing debates on women, gender and feminism.
2. To enlighten students about gender rights, gender justice and gender activism, particularly in the Indian context.
3. To motivate students towards gender sensitization and gender empowerment goals.

**Learning outcome**

1. This course will enable students to gain a fundamental understanding of gender and its related concepts & terminologies linking it to debates on sexuality/ sexualities in contemporary discourses.
2. It will help students to think beyond binaries and help students perceive gender both as a social construct and social category, created in and through cultural norms.
3. The students can use reflexive approach to contemplate on gender issues and be aware of gender related social problems in India.

**Syllabus (theory)**

**Unit I-Anthropology of Gender: Introduction:** Basic concepts, definitions and terminologies. Historical and theoretical developments, approaches and orientations to understand gender and related debates in Anthropology.  
**12 Hours**

**Unit II-** Intersectionality, kinship and power: intersection of gender with kinship structures, race, class, caste, ethnicity. Politics of reproduction, NRT.  
**10 Hours**

**Unit III: Gender in South Asia-** Gender narratives and performances in south-asian folk traditions, gender division of labour in South Asia, gender politics and activism in south asia; ethnographic studies, Feminism in India.  
**12 Hours**

**Unit IV: Gender and Globalisation- Impact of global capitalism on gender roles;** Economic perspectives: exploring new dimensions of household, women in Work Space and Public Spaces, gender and religious leadership, gender in digital space.  
**11 Hours**

**Tutorials**

Tutorials will focus on training students for conducting fieldwork exercise on any gender based social issue and prepare a brief report. The students will be taught to Review an ethnography/ monograph based on gender. The students will be encouraged to make an annotated bibliography on any selected theme within the domain of gender and sexuality.

### **Core readings**

1. Aneja, Anu (2019) Women's and Gender Studies in India: Crossings. Routledge
2. Channa, Subhadra Mitra. (2013). Gender in South Asia: Social Imagination and Constructed Realities. Cambridge University Press.
3. de Beauvoir, Simone (2015). The Second Sex. Vintage Classics. Chicago.
4. Dube, Leela (Ed.), (2001). Anthropological explorations in gender: Intersecting Fields. New Delhi: Sage Publications.
5. Ortner, Sherry B. (1996). Making Gender: The Politics and Erotics of Culture. Boston: Beacon

### **Additional Readings**

1. Mascia-Lees E. Frances, Nancy Johnson Black (2017) Gender and the Body. Illinois. Waveland press.
2. Mehrotra, Nilika (2013). Disability, Gender and State Policy: Exploring Margins. Jaipur: Rawat Publications.

### **Assessment Methods**

Written assignment, practical examination and theory examination.

### **Teaching learning process**

Lectures, Active participation of students in class debates and discussions, sharing of experiences and dialogues. Innovative fieldwork exercises and workshops, short documentaries on gender issues.

**Keywords:** Gender, gender identity and gender expression, Feminism, South Asia, gender identity, gender narratives, gender performances, Gender discrimination, gender rights and gender justice.

### Semester-III

#### DISCIPLINE SPECIFIC ELECTIVES (DSE-9) Linguistic Anthropology

| Course Title and Code   | Total Credits | Credit distribution of the course |           |
|-------------------------|---------------|-----------------------------------|-----------|
|                         |               | Lecture                           | Practical |
| Linguistic Anthropology | 04            | 03                                | 01        |

#### Course Objectives

1. To understand the significance of language and culture in the history of humanity
2. To understand the relationship between language and communication

#### Learning Outcomes

- The students will be able to know how the use of language is important for communication
- Facilitate an understanding about the social context of language and its significance in socialization process.

#### Syllabus

##### Unit I: Meaning and Scope

Meaning, Nature and Scope of Linguistic Anthropology. Relation with other branches. Socio-cultural dimensions of language. Evolution of language and symbolic communication. Verbal and non-verbal communication by early huminids. characteristics of language. Tribal languages, endangered languages, and revitalization. Linguistic relativism

**12 Hours**

##### Unit II: Social Context of Language Use

Process of language acquisition and socialization. Structural linguistics: Lingua franca, parole, language and culture relationship, Edward Sapir-Whorf hypothesis, language, and social roles

**10 Hours**

##### Unit III: Structure of Linguistic Forms

Phonemes and phonology, morphemes and morphology, syntax and semantics, lexical relationships: Synonymy, antonymy, homonymy, homonymy.

**11 Hours**

##### Unit IV: Sanskrit as Ancient Indian Language

Linguistic affinities of Sanskrit (Indo-European/Indo-Aryan), Indian Culture and Heritage depicted through Sanskrit; Pre-Sanskrit languages: Prakrit (Indus Valley Civilization 2300-2500BC); Panini's Ashtadhyayi (7<sup>th</sup> and 8<sup>th</sup> Century); Brahmi Script (9<sup>th</sup> and 10<sup>th</sup> Century); Sanskrit Grammar and its scientificity.

**12 Hours**

**Keywords: language, culture, communication, socialization, structural linguistics**

#### Practical

**30 Hours**

1. Students use of specialized equipments/ softwares for understanding the language diversity and enhancing acquisition of MTB-MLE (Mother Tongue Based - Multilingual Education).
2. Use of Artificial Intelligence (AI) in documentation of endangering languages as a part of New Education Policy (NEP 2020).

3. Based on practical experiences, students are required to prepare and present the group-based project and discussion.

### **Core Readings**

1. Duranti, A. 1997. *Linguistic Anthropology*. Cambridge: Cambridge University
2. Misra, K. K. .2000. *Text Book of Anthropological Linguistics*. New Delhi: Concept Pub.
3. Verma, M.K. 1998. *Socio–linguistics, Language and Society*. New Delhi: Sage Publications.
4. Hymes, D. 1974. *Foundations in Sociolinguistics: An Ethnographic Approach*. Philadelphia:

### **Suggested Readings**

1. Chomsky, N. 1986. *Knowledge of Language*. New York: Praeger.
2. Krishna, S. 1991. *India's Living Languages*. New Delhi: Allied Publishers.
3. Laura, M. A. 2012. *Living Language: An Introduction to Linguistic Anthropology*. Oxford: Wiley-Blackwell.

## Semester-III

### DISCIPLINE SPECIFIC ELECTIVES (DSE-10)

#### Economic Anthropology

| Course Title          | Total Credit | Credit distribution |           |
|-----------------------|--------------|---------------------|-----------|
| Economic Anthropology | 04           | Theory              | Practical |
|                       |              | 03                  | 01        |

#### Introduction

Economic Anthropology examines the production, distribution, exchange, and consumption of goods and services across cultures, emphasizing the embeddedness of economic processes in social, cultural, political, and ecological contexts. It contrasts with mainstream economics by prioritizing ethnographic methods, cross-cultural comparison, and holistic analysis over universal models of rational choice.

#### Course Objectives

- Introduce key concepts, theories, and methods in Economic Anthropology.
- Analyze diverse economic systems (subsistence, reciprocal, redistributive, market) through ethnographic case studies.
- Examine the interplay between economy, culture, power, gender, and environment.
- Critically evaluate the impacts of capitalism, globalization, and development on local communities, with special reference to India.

#### Learning Outcomes

By the end of the course, students will be able to:

- Differentiate Economic Anthropology from neoclassical economics and apply anthropological perspectives to economic phenomena.
- Critically discuss major theoretical debates and their relevance to contemporary issues.
- Interpret ethnographic data on production, exchange, consumption, and inequality.
- Reflect on ethical and applied dimensions of economic anthropology in development, sustainability, and policy contexts in India and globally.

#### Syllabus (theory)

##### Unit I: Foundations and Theoretical Perspectives

12 Hours

Emergence of Economic Anthropology; its relationship with Economics, Sociology, and other subfields; Formalist vs. Substantivist debate. Culturalist and Marxist/political economy approaches. Reciprocity (generalized, balanced, negative), redistribution, exchange, value, property, and moral economy. Case Studies: Gift economies, Kula, Potlatch.

##### Unit II: Production, Livelihoods, and Modes of Economy

10 Hours

Subsistence strategies: Foraging/hunter-gatherers (“original affluent society”), pastoralism, shifting and settled cultivation, peasant economies; Property regimes: Commons, land tenure, alienation; ecological and technological dimensions. Case studies from India (tribal economies, Jajmani system and Agrarian transformations).

##### Unit III: Exchange, Consumption, and Markets

12 Hours

Systems of exchange: Barter, money, markets; formal and informal economies, Consumption, commodities, and material culture; status, identity, and display. Financialization, debt, remittances, Modernization and neoliberal models. Market and the moral economy of Peasants. Gendered labor, Digital India and the Gig Economy

**Unit IV: Contemporary Issues, Development, and Applied Economic Anthropology 11 Hours**

Economic anthropology of development, poverty, and inequality; Critiques of Impacts on indigenous/tribal communities. The Social Life of Infrastructure; Economic processes Economic Justice and Sustainability issues.

**Practical (1 Credit) 30 Hours**

**Field-based Ethnographic Research on Economic Practices** (approx. 30-45 hours, including fieldwork).

Objectives: Apply concepts through hands-on research; develop skills in observation, interviewing, and analysis.

Activities:

Students (individually or in small groups) will conduct a short ethnographic study (e.g., 5-7 days of fieldwork) on a local economic topic, such as a market, informal economy, household livelihood strategies, craft production, or urban vending in Delhi/NCR or a nearby area

Outputs: Field notes, a short report (1500-2000 words) or presentation analyzing findings in relation to course concepts, plus reflexive notes on ethics and challenges

**CORE READINGS**

1. **Aneesh, A. (2015).** *Neutral Accent: A Case Study of Globalized India*. Princeton University Press.
2. **Appadurai, A. (1986).** "Introduction: Commodities and the Politics of Value." In *The Social Life of Things*.
3. **Breman, J. (2019).** *Capitalism, Inequality and Labour in India*. Cambridge University Press.
4. **Carrier, J. G. (Ed.). (2020).** *A Handbook of Economic Anthropology* (3rd ed.). Edward Elgar Publishing
5. **Damodaran, H. (2018).** *India's New Capitalists: Caste, Business, and Industry in a Modern Nation*. Hachette India.
6. **Harriss-White, B. (2020).** *India Working: Essays on Society and Economy*. Cambridge University Press.
7. **Mauss, M. (2016).** *The Gift: Expanded Edition*. Hau Books
8. **NITI Aayog (2025/2026).** *Latest Reports on Digital Transformation and Rural Livelihoods*
9. **Parnaik S. M. (1996).** Displacement, Rehabilitation and Social Change: The Case of Paraja Highlanders. New Delhi: Inter-India
10. **Polanyi, K. (2001 [1944]).** *The Great Transformation: The Political and Economic Origins of Our Time*. Beacon Press.
11. **Hann, C., & Hart, K. (2011).** *Economic Anthropology: History, Ethnography, Critique*. Polity Press.

### Semester-III

#### DISCIPLINE SPECIFIC ELECTIVES (DSE-11)

##### Political Anthropology

| Course Title and Code  | Total Credits | Credit Distribution of the Course |           |
|------------------------|---------------|-----------------------------------|-----------|
|                        |               | Lecture                           | Practical |
| Political Anthropology | 04            | 03                                | 01        |

##### Course Objectives

1. To understand key concepts such as power, authority, legitimacy, and governance.
2. To examine state and stateless political formations.
3. To analyse political processes, including identity, representation, participation, and resistance.
4. To understand customary law and legal pluralism in contexts of state and nation.

##### Learning Outcomes

By the end of the course, students will be able to:

1. Understand the evolution and contemporary relevance of political processes and political systems using anthropological frameworks.
2. Understand the role of power, authority and governance in different cultural settings.

##### Syllabus (theory)

**Unit-I:** Political Anthropology: Concepts and Approaches, Emergence of Political Anthropology Concepts: power, authority, agency, legitimacy, Governmentality. Stateless societies and segmentary lineage systems.  
**12 Hours**

**Unit-II:** Political Institutions: Structure and Process, Variation in Types of Political Organisation, Diverse Roles of Political Institutions in Small-Scale Communities. Bureaucracy and Governance, Anthropology of the State. Concept of customary law: norms, sanctions, and social control and Interface with state law. Kinship and Politics, Dispute Resolution.  
**12 Hours**

**Unit-III:** Local Governance, Panchayati Raj Institutions (PRIs), Urban local bodies. Village councils, tribal governance systems, and kinship networks. Tribal movements.  
**11 Hours**

**Unit-IV:** Gender, caste, and marginality, state, and democracy. Issues of representation and identity. Caste Politics, Ethnic movements. Digital governance and its implications.  
**10 Hours**

**Keywords:** Political Anthropology, Anthropology of State, Customary Law and Legal Pluralism, Representation, Identity.

**Practical**

**30 Hours**

1. Design a field-based ethnographic research proposal on any of the following:

Functioning of local governance bodies (Panchayat / Municipality), Role of customary law in dispute resolution, Political participation at the community level, Bureaucratic processes (ration office, local administration, etc.), Implementation of a government scheme, Role of NGOs in governance, Women in governance.

2. Submission of Case Study Report of any contemporary concerns, political literature, reports, magazines, journals, etc., using anthropological concepts (power, governance, customary law, governmentality, etc.).
3. Oral presentation of a research project based on fieldwork, theoretical linkage, and discussion.

### **Suggested Readings**

1. Bailey, F. G. (1963). *Politics and Social Change*. Berkeley: University of California Press.
2. Balandier, G. (1970). *Political anthropology* (A. M. Sheridan Smith, Trans.). Allen Lane The Penguin Press. (Original work published 1967)
3. Evans-Pritchard, E. E. (1940). *The Nuer: A description of the modes of livelihood and political institutions of a Nilotic people*. Oxford University Press.
4. Fortes, M., & Evans-Pritchard, E. E. (Eds.). (1940). *African political systems*. Oxford University Press.
5. Foucault, M. (1991). Governmentality. In G. Burchell, C. Gordon, & P. Miller (Eds.), *The Foucault effect: Studies in governmentality* (pp. 87–104). University of Chicago Press.
6. Kurtz, D. V. (2001). *Political anthropology: Power and paradigms*. Westview Press.
7. Weber, M. (1978). *Economy and society* (G. Roth & C. Wittich, Eds.). University of California Press.

**Semester-III**  
**DISCIPLINE SPECIFIC ELECTIVES (DSE-12)**

**Anthropology of Development**

| Course Title and Code              | Total Credits | Credit distribution of the course |           |
|------------------------------------|---------------|-----------------------------------|-----------|
|                                    |               | Lecture                           | Practical |
| <b>Anthropology of Development</b> | <b>04</b>     | <b>03</b>                         | <b>01</b> |

**Course Objectives**

1. To understand the term Development, evolution of the concept and theoretical paradigm.
2. To study the engagement by different stakeholders at various development activities
3. To understand ethical issues and evaluation of development project, community participation, livelihood and empowerment

**Learning Outcomes**

- The students will be able to understand the concept and approaches in anthropology of development.
- The students will be able to know the realities of developmental issues at grassroot level.
- Examine the role of anthropologist and other agencies in development process.

**Syllabus (theory)**

Unit I: Meaning and Scope: understanding development: Theory and Practice classical foundations and debates.  
**10 Hours**

Unit II: Approaches in the Anthropology of Development **8 Hours**

Unit III: Anthropology and Development Interfaces, Globalization, Sustainable Development, Constitutional Provision, Gender and Development, Indigenous Knowledge and Development, Issues of Displacement, Development and conservation debate/ Development projects and social logic.  
**13 Hours**

Unit IV: Role of Anthropology in Development, Community Development, Agencies for Development Issues and challenges for Development, Social Impact Assessment, RRA/PRA  
**14 Hours**

**Keywords: Policy, Development, Community, Evaluation, Agencies, PRA**

**Practical 30 Hours**

1. Prepare a project based on any contemporary issues relating to development project in India by employing various sources viz. books, journals, magazines, government reports newspaper articles, etc.
2. Provide a comprehensive bibliography.
3. Presentation of the project and group discussion

## Core Readings

1. Cochrane, Glynn. 1971. *Development Anthropology*. OUP
2. Edelman, Marc & Angelique Haugerud (eds) 2005. *The anthropology of development and globalisation: From classical political economy to contemporary neoliberalism*. Oxford: Blackwell.
3. Gardener, K. & D. Lewis 2015. *Anthropology and Development: Challenges for the twenty-first century*. London: Pluto
4. Escobar, Arturo. 1995. *Encountering Development: The Making and Unmaking of the Third World*, Princeton, N. J. Princeton University Press.
5. Harrison, E. & Crewe, E. 1999. *Whose development? An ethnography of aid*. London: Zed Books
6. Mathur, Hari Mohan (ed). 1977. *Anthropology in Development Process*. New Delhi. Vikas Publishing House

## Suggested Readings

1. Berreman, Gerald D. 1994. *Anthropology, Development and Public Policy. Occasional*
2. *Papers in Sociology and Anthropology* Vol.4, pp.3-32.  
<https://www.nepjol.info/index.php/OPSA/article/view/1083>
3. Chambers, Robert, 2013. *Rural Development: Putting the Last First*, London: Longman (1983).
4. Mosse, David, and David Lewis. 2005. *The Aid Effect: Giving and Governing in International Development*. Pluto Press
5. Olivier de Sardan, Jean-Pierre. 2005. *Anthropology and Development: understanding social change*. London: Zed Press.
6. Mair, Lucy. 1984. *Anthropology and Development*. London: Macmillan

**Semester-III**  
**Generic Elective GE-3**  
**Indian Prehistory**

| Course Title and Code | Total Credits | Credit Distribution of the Course |           |
|-----------------------|---------------|-----------------------------------|-----------|
|                       |               | Lecture                           | Practical |
| Indian Prehistory     | 04            | 03                                | 01        |

### Course Objectives

To critically explore the prehistoric roots of the Indian subcontinent through its geological context, key archaeological sites, and evolving cultural patterns, from early foragers to complex societies.

### Learning Outcomes

By the end of the course, students will be able to:

- Analyze the geological and environmental backdrop of Indian prehistory.
- Evaluate key theoretical frameworks in archaeology and their relevance to Indian contexts.
- Understand the transition from foraging to farming and the formation of complex settlements.
- To understand the legacy of early Indian civilizations through material and cultural aspects.

### Course Content

#### Unit I: Geological, Environmental, and Theoretical Perspectives. 12 Hours

- Overview of major geological formations in India.
- Stratigraphy of the Indian subcontinent: implications for cultural chronology.
- Middle-Range Theory and Processual Archaeology: science and systems thinking.
- Post-Processual and Postmodern Archaeology: agency, symbols, and subjectivity.

#### Unit II: Early Human Adaptations – Palaeolithic Cultures in India. 11 Hours

- Indian Palaeolithic Cultures: Regional Patterns and Material Culture. Sites across Northern, Western, Central, Eastern, and Southern India.
- Tool typologies, raw materials, and cognitive evolution.

#### Unit III: Transitional Cultures – The Mesolithic and Beginnings of Agriculture. 12 Hours

- The Indian Mesolithic: Transition and Transformation.
- Microlithic technology and subsistence diversification across regions.
- The Agricultural Revolution and Early Village Cultures.

#### Unit IV: Emergence of Early Civilisation. 10 Hours

- Emergence of urban centers and state systems.
- The Harappan Civilisation: urban planning, trade, symbolism, and statecraft.
- Comparative perspectives: Harappa and other contemporary civilisations.

#### Practical/ Project 30 Hours

1. Identification of stone tools-type, technology and function
2. Identification of ceramic traditions- type, technology and function
3. Computer applications for archaeology
4. Geographical Information System (GIS) for archaeology

### Core Readings

1. Allchin, B., and Allchin, R. (1997). *Origins of a civilization: The prehistory and early archaeology of South Asia*. New Delhi: Viking.
2. Chakravarty, K. K., and R. G. Bednarik. (1997). *Indian Rock Art in Global Context*. Delhi: Motilal Banarasi Das & IGRMS.
3. Bhattacharya, D.K. (2006). *An outline of Indian Prehistory*. Delhi: Palaka Prakashan.
4. De Terra, H. and T.T. Paterson, ( 1939). *Studies on the Ice Age in India and Associated Human Cultures*. Washington: Carnegie Institution of Washington Publication No.493.
5. Sankalia, H.D. (1974). *The Prehistory and Protohistory of India and Pakistan*. Pune: Deccan College Postgraduate and Research Institute.
6. Shinde, V. (Ed.). (2015). *Harappan archaeology: Early sites in Western India*. Oxford University Press.
7. Wheeler, M. (1968). *The Indus Civilization* (Vol. 1). Cambridge University Press Archive.

### Suggested Readings

1. Clark, J.D. and Sharma, G.R. (Eds.) *Palaeoenvironment and Prehistory in the Middle Son Valley, Madhya Pradesh, North Central India*. Allahabad: Abinash Prakashan.
2. Dhavalikar, M.K. (Ed.). (2013). *Prehistory of India*. New Delhi: Manohar Publishing.
3. Fagan B. M. (2004). *People of the Earth: An Introduction to World Prehistory*. New Jersey: Pearson Education.
4. H. and R.F. Heizer. (1969). *An Introduction to Prehistoric Archaeology*. New York: Hold, Rinehart and Winston, INC. Hole,
5. Lee, R.B and I. Devore (Eds.) (1977). *Man the Hunter*. Chicago: Aldine Publishing Company.

**Semester-III**  
**Generic Elective GE-4**  
**Anthropology of Northeast India**

| Course Title and Code           | Total Credits | Credit distribution of the course |          |
|---------------------------------|---------------|-----------------------------------|----------|
|                                 |               | Lecture                           | Tutorial |
| Anthropology of Northeast India | 04            | 03                                | 01       |

**Course Objectives:**

1. To introduce students to the historical, political, and demographic context of Northeast India, with an emphasis on colonial and post-independence transformations.
2. To critically examine development policies and governance frameworks affecting the region.
3. To explore the cultural richness of Northeast India through its arts, music, festivals, and ethnographic literature, enabling a nuanced understanding of identity, tradition, and sustainability.

**Learning Outcomes**

1. Students will be able to critically analyse the socio-political history and identity politics of Northeast India in both colonial and post-colonial contexts.
2. Develop the ability to assess the impact of development and policies on the region's environment, economy, and people.
3. Demonstrate an understanding of the region's cultural diversity and ethnographic narratives through engagement with case studies and various forms of writing.

**Syllabus**

**Unit I Situating Northeast India**

**12 Hours**

History and demography, Colonial intervention, Post-independence conflicts, Traditional Institutions, Political and Economic Transformation, Identity Politics

**Unit II Development, Governance, and Policy**

**12 Hours**

Development approach, Biodiversity Conservation, Tourism, Constitutional Safeguards, Look East Policy

**Unit III Cultural Heritage**

**11 Hours**

Arts and Aesthetics, Architecture, Music, Festivals, Case Studies on Sustainability

**Unit IV Ethnographies on Northeast**

**10 Hours**

Classical British Ethnography, Contemporary Ethnography, Ethnofiction, Autoethnography

**Tutorial:** The students shall be required to discuss and write tutorial assignments around certain important topics of contemporary relevance.

### Core Readings

1. Ao, Temsula. 2005. *These Hills Called Home*. Penguin
2. Bhagat Oinam, Dhiren A. Sadokpam. (eds) 2018. *Northeast India: A Reader*. Taylor & Francis.
3. Hazarika, Sanjoy. 2000. *The Strangers of the Mist: Tales of War and Peace from India's Northeast*. India Penguin
4. Nongbri, Tiplut (ed) 2021. *Materiality and Visuality in North East India: An Interdisciplinary Perspective*. Springer
5. Pachau, Joy. 2014. *Being Mizo: Identity and Belonging in Northeast India*. New Delhi: Oxford University Press

### Suggested Readings

1. Patnaik, SM. 2014. 'Consuming Culture: The Refiguration of Aesthetics in Nagaland Cultural Tourism in India's North East' In Kaur, R., & Dave-Mukherji, P. (Eds.). *Arts and Aesthetics in a Globalizing World* (1st ed.). Routledge.

## Semester-III

### Skill Enhancement Course (SEC-1)

#### Participatory Research and Social Impact Assessment

| Course Title                                        | Total Credit | Credit distribution |           |
|-----------------------------------------------------|--------------|---------------------|-----------|
| Participatory Research and Social Impact Assessment | 02           | Theory              | Practical |
|                                                     |              | 01                  | 01        |

#### Course Introduction

This course connects the anthropological theories and its application in policy, administration and development studies. It introduces students to the collaborative methodologies of Participatory Research (PR) and the evaluative framework of Social and Environmental Impact Assessment.

#### Course Objectives

1. To understand the shift from doing research on People to work collaboratively?
2. To master the tools of Participatory Rural Appraisal (PRA) and Rapid Rural Appraisal (RRA).
3. To comprehend the legal and procedural frameworks governing Social Impact Assessments in India and globally.

#### Learning Outcomes

By the end of this course, students will be able to:

1. Design and facilitate a participatory research project within a community.
2. Conduct a baseline social study for an SIA report.
3. Analyse the impact of development on marginalized groups, including gender and indigenous perspectives.

#### Syllabus (theory)

##### Unit 1: Introduction Participatory Research

12 Hours

Participatory Research as a critique of "top-down" development approach. Issues of Power dynamics, Inclusivity of muted lots (Gender, Caste, and Age). The role of the researcher as a facilitator perspective of Action Anthropology and Participatory Action Research (PAR).

##### Unit 2: Tools and Techniques of PRA/RRA

10 Hours

Incorporating qualitative narratives with participatory quantitative data. Social Mapping, Resource Mapping, and Transect Walk, Time Lines, Trend Analysis, and Seasonal Calendars. The relationship between a Social Impact Assessment(SIA) and Environmental Impact Assessment (EIA)

##### Unit 3: Impact Prediction and Mitigation Planning

10 Hours

Assessing social, cultural, and economic impacts; Displacement and Resettlement; Impact on Heritage and Indigenous Knowledge; Formulating a Social Impact Management Plan. Relevant case studies.

#### Practical

Practical exercises shall be based on the course content.

Students are expected to do exercises pertaining to:

1. PRA in a community setup.
2. RRA in a real-life content.
3. Preparing a research strategy for mitigation of natural disasters.
4. A transect walk and prepare a Resources mapping exercise.
5. A case study to show the social impact of displacement & resettlement.
6. Impact prediction using anthropological perspectives

### Suggested Readings

1. **Chambers, R.** (1997). *Whose Reality Counts? Putting the First Last*. Intermediate Technology Publications.
2. **Bhattacharyya, J.** (2021). "Participatory Research in Anthropological Traditions: A Review of Methods and Ethics." *Journal of Applied Anthropology*.
3. **Esteves, A. M., & Vanclay, F.** (2024). *Social Impact Assessment: Guidance for Assessing and Managing the Social Impacts of Projects*. International Association for Impact Assessment (IAIA).
4. **Kindon, S., Pain, R., & Kesby, M.** (Eds.). (2020). *Participatory Action Research Approaches and Methods: Connecting People, Participation and Place*. Routledge.
5. **Ministry of Rural Development.** (2025). *Updated Handbook for Social Impact Assessment under RFCTLARR Act*. Government of India.
6. **Patnaik S. M.** (1996). *Displacement, Rehabilitation and Social Change: The Case of Paraja Highlanders*. New Delhi: Inter-India

**Semester-III**  
**Skill Enhancement Course (SEC-2)**  
**Ergonomics Anthropology**

| Course Title            | Total Credit | Credit distribution |           |
|-------------------------|--------------|---------------------|-----------|
| Ergonomics Anthropology | 02           | Theory              | Practical |
|                         |              | 01                  | 01        |

**Course objective**

1. To introduce knowledge about designing of health workplace, equipment, machine & surrounding.
2. The course will equip in theoretical and applied aspect of ergonomic anthropology.

**Learning outcomes**

1. The student will be trained with tools and techniques of ergonomic anthropology that can help in improvement of effective workplace design.
2. This course will not merely train the student about designing workplace but they will also be train to insure the safety, health and well-being of the workers.
3. In this course will help the student to develop innovative idea about reducing the risk and management of occupational disease.

**Syllabus (theory)**

**Unit 1: Introduction**

**12 hours**

Concept and evolution of Ergonomics, Historical background, Scope of Ergonomics & Relevance in Anthropology, Evolving of Ergonomic Anthropology, Bio-mechanics concepts.

**Unit 2: Ergonomics: Theories and Concepts**

**12 hours**

Theories of healthy standing and sitting, Posture stress, free posturing, Concept of safety, efficiency and comfort, Clearance and Reach.

**Unit 3: Ergonomics principle in workplace design**

**11 hours**

Use of Percentiles in designing products, Average man in designing- A fallacy, Design of workplace and work environment.

**Unit 4: Ergonomic Applications to reduce Occupational health hazards**

**10 hours**

Occupational health, Concept of Universal Design, Designing for Differently abled and Elderly

**Practical:**

1. Operational Designing measurements
2. Measurement techniques (Biomechanics)
3. Assessment of posture, Gait analysis, ergonomic assessment of work stations.
4. Measurement of joint range of motion using goniometer.
5. 1-2 workshops/ project over the academic semester on topics related to ergonomics. These talks would bring students with brainstorming discussion on current issues and help in developing innovative idea.

**Core readings**

1. Ergonomics in Design Methods and Technique by MM Soares and Francis Robert, 2016 (CRC Press).
2. Ergonomics for beginners: A quick reference guide by Jan Dul, Bernard Weerdmeester, 2008 (CRC Press).
3. Design and Anthropology edited by Wendy Gunn and Jared Donovan, 2012 (Routledge).
4. Applied Bio-mechanics concepts & connections (2008) John Mclester; Peter St. Pierre. Wadsworth Publishing Co.

## Semester-IV

### DSC-9

#### Paleoanthropology

| Course Title and Code     | Total Credits | Lecture | Practical | Tutorial | Eligibility                        |
|---------------------------|---------------|---------|-----------|----------|------------------------------------|
| Paleoanthropology (DSC-9) | 04            | 03      | 01        | 00       | UG in Anthropology / Life Sciences |

#### COURSE OBJECTIVES

To give students a thorough and up-to-date understanding of the hominin fossil record, from the earliest African ancestors to modern humans.

To introduce students to the key methods used in paleoanthropology, including geochronological applications, comparative anatomy, stone tool analysis, and the growing role of ancient DNA and stable isotope studies.

To examine the Indian and South Asian fossil and archaeological record in its own right and in relation to broader patterns of hominin evolution and dispersals.

To encourage awareness of the ethical responsibilities involved in studying human remains and working with communities whose cultural heritage is connected to paleoanthropological sites.

#### LEARNING OUTCOMES

By the end of this course, students will be able to:

1. Describe and compare the major hominin species in the fossil record, explaining their key physical features and geographical range.
2. Explain the main methods used to date paleoanthropological sites and reconstruct past environments.
3. Critically read and discuss research articles from paleoanthropology journals, identifying the evidence, the argument being made, and the alternative interpretations.
4. Describe the key fossil and archaeological sites in India and South Asia within the wider context of human evolution.
5. Carry out basic practical tasks, including fossil cast identification, skeletal measurement, lithic description, and structured field observation, and report on findings in a clear and organised manner.

#### COURSE CONTENT

##### Unit I: Understanding Human Evolution: Background and Methods 15 Hours

History and debates in paleoanthropology. Methods, dating, taphonomy, environments, and analytical tools of paleoanthropology; Evolving scientific debates, fossil interpretation, and technological advances. Lomekwian culture, early hominins, bipedalism, anatomy, diet, ecology, key fossils, evolutionary relationships, and debates on the origins of the genus *Homo* across Africa.

##### Unit II: The Genus *Homo*: From Early *Homo* to Archaic Humans 12 Hours

Evolution of *Homo*, early species, tools, dispersal, diversity, scavenging vs hunting debate, island

hominins, Oldowan, Acheulean, Middle Palaeolithic, Middle Pleistocene populations, and genetic evidence shaping global understanding of human ancestry.

### **Unit III: India and South Asia in the Story of Human Evolution**

12 Hours

South Asian paleoanthropology, Siwalik fossils, Narmada hominin, archaeology, Acheulean sites, microliths, dispersals, genetics, and the history of research in human evolution studies, decolonising paleoanthropology.

### **Unit IV: Neanderthals, Modern Human Origins, and the Peopling of the World**

6 Hours

Neanderthals, Upper Palaeolithic, Denisovans, modern human origins, interbreeding, dispersals, fossils, genetics, symbolic behaviour (includes prehistoric ornaments, use of ochre mineral, rock art, etc.), evolutionary models, and the global spread of *Homo sapiens* overview.

### **PRACTICAL**

30 Hours

1. Primate and Hominin Osteology: Students identify, label, and compare cranial and post-cranial skeletal elements of non-human primates and humans using casts and reference specimens. Key measurements are recorded, and differences between ape and human skeletons are discussed in terms of their functional and evolutionary significance.
2. Fossil Identification and Description: Students work with a set of fossil hominins representing key species across the hominin lineage, from *Australopithecus afarensis* through to early modern *Homo sapiens*. For each specimen, they record the site and date of discovery, describe the main anatomical features, note what is significant about the specimen, and place it within the overall picture of human evolution. Special attention is given to *Homo erectus* and its comparison with other archaic *Homo* specimens.
3. Stone Tool Identification and tool knapping: Students examine replica stone tools or published photographs representing the main technological traditions in the paleoanthropological record: Oldowan, Acheulean, Lomekwian, Middle Palaeolithic, Upper Palaeolithic and Mesolithic. They practise identifying tool types, describing their basic features, and associating each tradition with the hominin species and time periods involved. A comparative table and a brief written summary are submitted. Replicating stone tools through experimental flintknapping.
4. Field Excursion and Report: A visit to a relevant palaeontological or archaeological site or museum collection, such as the Delhi Ridge, JNU campus, Geological Survey of India Museum, a Siwalik exposure, or a regional site of significance, for structured observation, documentation, and discussion. Students submit a field report of no more than 1,500 words that covers the site context, what was observed, and a critical reflection on the site's place in Indian and global paleoanthropology.

### **Core Readings**

1. Klein, R. G. (2009). *The Human Career: Human Biological and Cultural Origins* (3rd ed.). University of Chicago Press.
2. Stringer, C., & Andrews, P. (2011). *The Complete World of Human Evolution* (2nd ed.). Thames & Hudson.
3. Wood, B. (2005). *Human Evolution: A Very Short Introduction*. Oxford University Press.
4. Tattersall, I. (2015). *The Strange Case of the Rickety Cossack, and Other Cautionary Tales*

from Human Evolution. Palgrave Macmillan.

5. Reich, D. (2018). *Who We Are and How We Got Here: Ancient DNA and the New Science of the Human Past*. Oxford University Press.
6. Fleagle, J. G., Baden, A. L., & Gilbert, C. C. (2024). *Primate adaptation and evolution*. Academic Press.

### **Suggested Research Articles**

1. Hublin, J.-J., et al. (2017). New fossils from Jebel Irhoud, Morocco and the pan-African origin of *Homo sapiens*. *Nature*, 546, 289–292.
2. Prufer, K., et al. (2014). The complete genome sequence of a Neanderthal from the Altai Mountains. *Nature*, 505, 43–49.
3. Berger, L. R., et al. (2010). *Australopithecus sediba*: A new species of Homo-like Australopithecine from South Africa. *Science*, 328, 195–204.
4. Lordkipanidze, D., et al. (2013). A complete skull from Dmanisi, Georgia, and the evolutionary biology of early *Homo*. *Science*, 342, 326–331.
5. Morwood, M. J., et al. (2004). Archaeology and age of a new hominin from Flores in eastern Indonesia. *Nature*, 431, 1087–1091.
6. Patnaik, R. (2016). Indian Neogene Siwalik mammalian biostratigraphy: An overview. *Vertebrate Paleobiology and Paleoanthropology Series*, 423–444.
7. Bhandari, A., Kay, R. F., Williams, B. A., Tiwari, B. N., Bajpai, S., & Hieronymus, T. (2018). First record of the Miocene hominoid *Sivapithecus* from Kutch, Gujarat state, western India. *PLoS One*, 13(11), e0206314.
8. Pappu, S., et al. (2011). Early Pleistocene presence of Acheulian hominins in South India. *Science*, 331, 1596–1599.

### **ASSESSMENT METHODS**

Theory Examination and Continuous Assessment through practicals, field data report and seminar participation.

### **KEYWORDS**

Paleoanthropology, Human Evolution, Fossil Record, Australopithecines, *Homo erectus*, Neanderthals, Ancient DNA, Bipedalism, Stone Tools, Taphonomy, Dating Methods, Out of Africa, Siwalik Hominoids, Narmada Fossil, Indian Paleoanthropology, Middle Stone Age, Modern Human Origins, Archaic *Homo*, South Asian Prehistory, Hominin Dispersals, pre-Australopithecines, Levant, Europe, Asia, Australia.

## Semester-IV

### DSC-10

#### Tribal India

| Course Title and Code | Total Credits | Credit Distribution of the Course |           |
|-----------------------|---------------|-----------------------------------|-----------|
|                       |               | Lecture                           | Practical |
| Tribal India          | 04            | 03                                | 01        |

#### Course Objectives

1. To understand the anthropological concept of tribe and its relevance in the Indian context.
2. To examine the structures and functions of tribal social institutions and analyse dynamics of continuity, change & adaptation.
3. To analyse contemporary challenges tribal communities face and the role of development policies and legal frameworks in addressing tribal issues.

#### Learning Outcomes

1. Students will be able to assess the evolution and application of the concept of tribe in India, including debates around indigeneity.
2. Demonstrate understanding of tribal social systems and cultural practices, and articulate the ways in which these have been maintained or transformed in response to socio-economic and political pressures.
3. Evaluate tribal development strategies and policy frameworks and analyse their effectiveness in addressing displacement, marginalisation, and rights-based issues.

#### Syllabus (theory)

##### Unit I Concepts and Classification

10 Hours

Evolution of the concept of tribe in Indian context; Anthropological approaches to the study of tribe; the idea of indigenous people; geographic and linguistic distribution of tribes in India; Particularly Vulnerable Tribal Groups, Denotified Communities

##### Unit II Tribal social structure and institution: change and continuity

11 Hours

Kinship, family and marriage; traditional governance, customary law; livelihood and occupational pattern; religious faiths, beliefs and practices; tribal arts and aesthetics: Gender in tribal societies, youth dormitories; Age-grade systems; political organisation, Traditional ecological knowledge, Tribal health and Nutrition.

##### Unit III Contemporary tribal issues and challenges

12 Hours

Impact of Industrialization, urbanization and globalization; Politics of identity and ethnicity; socio-economic issues- land alienation, poverty, healthcare and education; social mobility; representation in Indian political system, participation in governance

#### **Unit IV Tribal development and policies:**

**12 Hours**

Approaches to tribal development: community-based approaches and participatory development. Plans and policies: National Tribal Policy, Forest Rights Act, affirmative action; tribal displacement and rehabilitation in India; PESA Act 1996, Role of NGOs & Civil Society.

#### **Practical**

**30 Hours**

1. Map out the various tribal communities on a map of India: migration pattern, kinship system, marriage practices, occupation, social unrest and conflict, religious beliefs and practices etc. The proposed exercise has to be executed based on intensive readings of tribal monographs available in the department library.
2. Write a book review of any tribal ethnography. The review has to be presented and discussed in the classroom.
3. Make a visual presentation digital poster on one tribe of your choice or as suggested by the course teacher. Focus on gender roles, sustainability, and cultural heritage.
4. Write a project report of not more than 3000 words on contemporary tribal issues in India.

#### **Core Readings**

1. Fürer-Haimendorf, Christoph von. 1982. *Tribes of India: The Struggle for Survival*. Delhi: Oxford University Press.
2. Srivastava, V. K. 2008. Concept of 'Tribe' in the Draft National Tribal Policy. *Economic and Political Weekly*, Vol. 43, No. 50 pp. 29-35
3. Vidyarthi, L.P. 1977. *Tribal Culture of India*: Concept Publishing company. New Delhi
4. Xaxa, Virginius. 2008. *State, society, and tribes: issues in post-colonial India*. New Delhi: Dorling Kindersley.

#### **Suggested Readings**

1. Radhakrishna, M. (2007). Urban Denotified Tribes: Competing Identities, Contested Citizenship. *Economic and Political Weekly*, 42(51), 59–64.
2. Nongbri, T. (2001). Democracy, Gender and Tribes : A Critical Appraisal of India's Constitutional Policies. *Indian Anthropologist*, 31(2), 1–14.
3. Patnaik, S. M. 1993 Patriarchy among the Parajas: Innocuous Tradition or Invisible Violence? *Indian Anthropologist* Vol.23 No 1 PP 65-71
4. Zhimo, A. G. (2019). Indigenous System of Governance and its Implication: The case of Nagaland. *Indian Anthropologist*, 49(2), 41–56.

## Semester-IV

### DSE-14

#### Anthropology of Public Policy

| Course Title and Code         | Total Credits | Credit Distribution of the Course |           |
|-------------------------------|---------------|-----------------------------------|-----------|
|                               |               | Lecture                           | Practical |
| Anthropology of Public Policy | 04            | 03                                | 01        |

#### Course Objectives

1. To examine the roles and nature of engagement by different stakeholders at various institutions.
2. To analyze the relationship between public policy, culture, community development and social justice.
3. To understand about the importance of public policy in safeguarding society, environment, etc.

#### Learning Outcomes

By the end of the course, students should be able to:

1. Understand the concept and approaches of anthropology of Public Policy, commitment of anthropologist in policy research and policy formulation, etc.
2. Know the significance of public policy in maintaining the well-being of the society
3. Examine the contemporary program and policies in India.
4. Apply anthropological methods in policy-research & evolution.

#### Syllabus (theory)

**Unit-I:** Anthropology of Public Policy. Meaning scope and Approaches. Emergence of Anthropology of Public Policy emergence of Anthropology and Public Policy: Interface, Applied Anthropology.

**12 Hours**

**Unit-II:** Relevance of Anthropologists in Public Policy and Administration: Contextualising Anthropological Knowledge: Power, Representation, and Public Policy, Debates.

**12 Hours**

**Unit-III:** Development Discourse and Community participation sustainable development goals, Development Agencies and local dynamics. Case studies of welfare, environment, health, and local governance.

**11 Hours**

**Unit-IV:** Methodological and Ethical concerns in Anthropology of Policy Research. Media and Public Policy. Implementation monitoring and Evaluation. Policy Appraisal, Social Impact Assessment (SIA).

**10 Hours**

**Keywords:** Policy, Development, Community, Evaluation, Agencies, Appraisal

## Practical

30 Hours

1. Prepare a project based on any contemporary issues related to public policy and governance in India by employing various sources viz. books, journals, magazines, government reports newspaper articles, etc.
2. Presentation of the project and group discussion.
3. Policy Brief (1500 words)
4. Evolution of one\_SDG relate programme.

## Core Readings

1. Belshaw, C. S. (Ed.). (2014). *The sorcerer's apprentice: An anthropology of public policy* (Vol. 4). Elsevier.
2. Geilhufe, N. L. (1979). Anthropology and policy analysis. *Current Anthropology*, 20(3), 577-579.
3. Patnaik, S. M. (2016). Whither anthropology in public policy?: Reflections from India. In S. Coleman, S. B. Hyatt, & Kingsolver (Eds.), *The Routledge Companion to Contemporary Anthropology* (1<sup>st</sup> ed.) (pp. 416-432). Routledge
4. Shore, C. (2012). Anthropology and Public Policy. In R. Fardon, O. Harris, T. H. J. Marchand, M. Nuttall, C. Shore, V. Strang, & R. A. Wilson (Eds.), *The SAGE handbook of social anthropology* (Vol. 2, pp. 89–104). SAGE.
5. Shore, C., & Wright, S. (Eds.). (2003). *Anthropology of policy: Perspectives on governance and power*. Routledge.

## Suggested Readings

1. Cairney, P. (2019). *Understanding Public Policy: Theories and Issues*. United Kingdom: Bloomsbury Publishing.
2. Fiske, S. J. (2006). Anthropology in pursuit of public policy and practical knowledge. *NAPA Bulletin*, 26(1), 82-107.
3. Head, B. W. (2022). *Wicked Problems in Public Policy: Understanding and Responding to Complex Challenges*. Switzerland: Springer International Publishing.
4. Wedel, J.R. & Feldman, G. (2005), Why an anthropology of public policy? *Anthropology Today*, 21(1), 1-2.
5. Van Willigen, J. (2002). *Applied anthropology: An Introduction*. Greenwood Publishing Group.

## Teaching Learning Process

Classroom teachings  
Seminars, presentations and group discussion  
Practical classes

## Assessment Methods:

Assignment, Theory and practical examinations (including practical records)

## Semester-IV

### DSE-15

#### KINANTHROPOLOGY

| Course Title and Code  | Total Credits | Credit Distribution of the Course |           |
|------------------------|---------------|-----------------------------------|-----------|
|                        |               | Lecture                           | Practical |
| <b>KINANTHROPOLOGY</b> | 04            | 03                                | 01        |

#### Course Objectives:

1. To introduce students to the applied knowledge of Biological Anthropology.
2. The course shows diverse and integrated nature of anthropological work and how the biological anthropological knowledge and methods can be applied for the human welfare.
3. The course equips in theoretical & applied aspect of Kinanthropology.

#### Learning Outcomes:

1. The students will be trained with tools and techniques of kinanthropology that can help understanding growth, exercise, performance and nutrition.
2. The students can develop holistic integrated approach that can help in the field of Physical Education, sport, recreation, rehabilitation and physiotherapy.
3. The student can be encouraged to come up with innovative idea of human welfare especially in sports, physical education, and education.

#### Unit I: History, Concept, Scope, Applications and relationship with allied disciplines

(12 Hours)

##### Human movements: Concept and determinants

1. Origin and evolution of Kinanthropology
2. Definition, Scope and relevance of Kinanthropology
3. Relationship with other allied disciplines
4. Recent advances and future perspectives in kinanthropological research
5. Applications of kinanthropology in health, sports, dance and forensic sciences

#### Unit II: Tools & techniques in Kinanthropology.

(12 Hours)

1. Traditional & modern methods in Kinanthropology
2. Physical fitness assessment
3. Sports injuries and rehabilitations

#### Unit III: Physical fitness and environmental stresses

(11 Hours)

1. Health and skill related components- Strength, endurance, flexibility, agility etc.
2. Effect of temperature extremes on the performance

#### Unit IV: Importance in Sports, Recreation and Physical Education

(10 Hours)

1. Physical conditioning Training-Techniques and Physiological effects
2. Body composition, Nutrition, Doping and Performance
3. Sports talent identification.

## **Practical**

**(30 hours)**

1. Kinanthropometric measurements: Stature, height, weight arms span, body circumference, skinfold, BMI, Bone Breadth.
2. Physical fitness assessment tests: Handgrip strength, flexibility test, cardiovascular endurance assessment and balance assessment.
3. Comparision of anthropometric, profiles among athletes of different sports.
4. Prepration of individual fitness profile.
5. 1-2 workshops/ project over the academic semester on topics related to kinanthropology.

### **Suggested readings:**

1. Singh, S.P., & Mehta, P. (2009). Human Body Measurements: concepts and application. PHI Learning Pvt. Ltd.
2. Physical activity and Growth by RJ Shephard, 1982 (Mosby).
3. Renson,R. (1989). From Physical Education to Kinanthropology: A Quest for Academic and Professional Identity. QUEST (41) 235-256
4. Human Body Composition by Heymsfield, Lohman, Wang and Going. 1996 (Human Kinetics).
5. Human Body Composition by Heymsfield, Lohman, Wang and Going. 1996 (Human Kinetics).

## Semester-IV

### DSE-16

#### Psychological Anthropology

| Course Title and Code      | Total Credits | Credit Distribution of the Course |           |
|----------------------------|---------------|-----------------------------------|-----------|
|                            |               | Lecture                           | Practical |
| Psychological Anthropology | 04            | 03                                | 01        |

#### Course Objectives

- Introduce student's to the theories and perspectives of psychological anthropology and their significance within anthropological frameworks.
- Examine culturally specific understandings of mind, self, emotion, and behavior especially with reference to the Indian contexts.
- Foster a critical perspective on mental health and illness, status and characteristic of mental health among the tribes in India.
- Equip students with analytical tools that are culturally sensitive and pertinent to anthropology and related disciplines.

#### Learning Outcomes

- Explain key concepts of Psychological anthropology and Indian psychology and their anthropological significance.
- Compare Indian and cross cultural perspectives of mind, self, and behavior.
- Analyze emotions, motivations, and rituals as culturally regulated psychological anthropological processes.
- Critically interpret mental health, illness, and healing practices in Indian contexts.
- Apply psychological anthropological perspectives to contemporary anthropological issues and research.

#### Syllabus (theory)

##### Unit 1: Emergence of Psychological Anthropology

10 Hours

Historical development of psychological anthropology: Psychological anthropology and its relationship to Cultural Psychology, Social Psychology, Psychiatry and Transcultural Psychiatry. Recent advances

##### Unit 2: Foundations of Human Behavior

10 Hours

Major theories of human behavior including evolutionary, biological, psychological, and anthropological perspectives, along with key thinkers and their contributions, socialization and personality development across culture.

##### Unit 3: Mind, Individual, Culture and Behavior

10 Hours

Identity Emotion, Motivation, and Human behavior in Universal and Indian contexts Role of everyday religion, ritual symbolism, and emotional regulations. Renunciation from below in Indian society. Key concepts from Indian psychology and their psychological anthropological interpretation.

#### **Unit 4: Psychiatric Anthropology and Mental Health**

**15 Hours**

Introduction to psychiatric anthropology, mental health, Culture and Mental illness. Ethno-psychiatry and Mental Health among Tribes and Aranya communities. Anthropological dimensions of depression, schizophrenia, borderline personality disorder, anxiety disorders, and culture-bound syndromes. Recent advances in psychiatric anthropology.

#### **Practical**

**30 Hours**

1. Qualitative and Quantitative Methods in Psychological anthropology
2. Fieldwork based Ethnographies on the following topics  
The students will formulate a research design and conduct a mini ethnography and submit their report on the following topics:
  - a. Religious or ritual space (temple, shrine, satsang, pilgrimage site)
  - b. Healing practice (Ayurveda clinic, yoga centre, faith healing context)
  - c. Everyday religious practices within family or community
  - d. On the concept of Self, emotion, suffering or well-being using Indian psychology
3. Psychological profiling using standard Psychological tests and their anthropological adaptation and Field testing
4. Ethical considerations in Psychological anthropological fieldwork.

#### **Suggested Readings**

- Imgham, J. M. (1996). *Psychological Anthropology Reconsidered*. Cambridge: Cambridge University Press.
- Melford E. Spiro. *Culture and Human Nature*. University of Chicago Press.
- Schwartz, Theodore, Geoffrey M. White and Catherine A. Lutz, eds. (1992). *New Directions in Psychological Anthropology*. Cambridge: Cambridge University Press.
- Srivastava. V.K. (1997). *Religious Renunciation of a Pastoral People* (1997). OUP
- Shweder, Richard A. and Robert A. LeVine, eds. (1984). *Culture Theory: Essays on Mind, Self and Emotion*. Cambridge: Cambridge University.
- Strauss, Claudia and Naomi Quinn. (1997). *A Cognitive Theory of Cultural Meaning*. Cambridge: Cambridge University Press.
- Sudhir Kakar. (2001). *The Essential Writings of Sudhir Kakar*. Delhi: Oxford University Press.

## Semester-IV

### DSE-17

#### Genetic Epidemiology

#### CREDIT DISTRIBUTION, ELIGIBILITY AND PRE-REQUISITES OF THE COURSE

| Course Title and Code | Credits | Credit distribution of the course |                     |
|-----------------------|---------|-----------------------------------|---------------------|
|                       |         | Lecture                           | Practical/ Practice |
| Genetic Epidemiology  | 04      | 03                                | 01                  |

#### Course Objectives

1. To integrate the principles from genetic epidemiology with fundamentals epidemiological concepts in human health and disease.
2. Assess and formulate suitable and robust study designs and analytical methods to comprehend the link between genetic variation and the diversity of human traits.
3. To critically evaluate genetic association studies and interpret the significance of genetic variation across various in health, disease and population research.

#### Learning Outcomes

The student will be able to:

1. Apply the basic principles of genetic epidemiology on complex diseases or traits
2. Design genetic epidemiological studies and analyse the genetic data in relation to phenotypic variation.
3. Comprehend the importance of genetic association studies and the assertions concerning the significance of genetic variation across various common diseases

#### Syllabus (theory)

##### Unit 1: Introduction to Genetic Epidemiology

12 Hours

Role of Genetics in medicine, preventive medicine, public health, and epidemiology; Linkage disequilibrium; Hardy-Weinberg law; HapMap Project; Genome India Project; CDCV vs Rare variant hypothesis, Ethical, legal and social issues (ELSI) in genetic epidemiology.

##### Unit 2: Study Designs

12 Hours

Familial Aggregation Studies; Linkage Studies; Candidate gene approach; Association Studies; Genome-wide Association Studies (GWAS); Whole genome studies with respect to non-communicable diseases and traits, methodological challenges in genetic epidemiological issue (population stratification). Case-control; population based and longitudinal studies

##### Unit 3: Gene and Environment

11 Hours

Environmental factors in genetic epidemiological studies; DNA methylation; Genetics in drug targets; Epigenetic arrays, challenges in epigenetic epidemiology, Gene-environment interactions in complex diseases.

## **Unit 4: Genetic Data**

**10 Hours**

Genotyping methods; Sequencing methods (NextGen sequencing); GWAS Catalog; Polygenic risk scores; DNA Biobanks; Statistical methods used in Genetic epidemiology; Software tools for genetic data analysis

### **Practical - (30 hours)**

1. Sample Collection Preservation and storage
2. DNA Extraction and Quantification and Quality Assessment
3. SNP Genotyping using standard interaction techniques
4. DNA Sequencing (Sanger and NexGen)

### **Suggested Readings**

1. Lyle J. Palmer, Paul R. Burton, George Davey Smith. An Introduction to Genetic Epidemiology. The Policy press, 2011
2. Melissa A. Austin, Terri H. Beaty, W. David Dotson. Genetic Epidemiology: Methods and Applications. CABI, 2013
3. Evangelos Evangelou. Genetic Epidemiology: Methods and Protocols. Humana Press (Springer Nature), New York, 2023
4. Juan Carlos Gomez-Verjan, Nadia A. Rivero-Segura. Principles of Genetics and Molecular Epidemiology. Springer Nature (Cham), 2022

### **Keywords**

Genetic epidemiology, Public health, GWAS, Sequencing, Anthropology

**Semester-IV**  
**DSE-18**  
**Medical Anthropology**

| Course Title         | Total Credit | Credit distribution |           |
|----------------------|--------------|---------------------|-----------|
| Medical Anthropology | 04           | Theory              | Practical |
|                      |              | 03                  | 01        |

**Total Teaching Hours:** Theory – 45 hours (3 hours/week); Practical – 30 hours (2 hours/week)

**Learning Objectives**

- To introduce students to the concepts scope and theories, Medical Anthropology.
- To develop critical understanding of the interface between culture, health, disease, society, and healthcare systems of India.
- To familiarize students with ethnomedical practices, medical pluralism, and health-seeking behaviour in tribal, rural, and urban India.
- To analyse the impact of globalization, development, and biomedicine on tribal health systems.

**Learning Outcomes**

By the end of the course, students will be able to:

- Explain the concept and theoretical perspectives in Medical.
- Demonstrate knowledge of traditional healing systems and medical pluralism in India.
- Analyse socio-cultural, economic, and political factors influencing health, illness, and healthcare access in tribal, rural, and urban settings.
- Identify ethical issues in medical anthropological research and public health interventions.

**Keywords:** Medical pluralism, Ethnomedicine, Biocultural approach, Critical Medical Anthropology, Health-seeking behaviour, Sickness and illness, Healing rituals, AYUSH systems, Tribal medicine, Cultural epidemiology, Bioethics, Global health.

**Syllabus (theory)**

**Unit I: Theoretical Foundations of Medical Anthropology** (15 hours)

Meaning scope and development of Medical Anthropology: Biocultural, interpretive/symbolic, and critical medical anthropology perspectives, Evolution of Medical Anthropology in India: Contributions of Indian anthropologists and early ethnographic accounts.

**Unit II: Ethnomedicine and Traditional Healing Systems** (10 hours)

Indigenous knowledge and ethnomedicine among tribal India (e.g., Naga, Bhil, Gond, Santal, and Andamanese communities). Healing rituals, shamanism, herbal medicine, and spiritual healing. . Indian systems of medicine: Ayurveda, Siddha, Unani, Yoga, Naturopathy (AYUSH) and their interface with

folk medicine. Medical pluralism: Co-existence and hierarchy of healing systems in rural and urban India; health-seeking behaviour and decision-making.

### **Unit III: Health, Society and Culture in India**

(10 hours)

Cultural and Social dimensions of Tribal, Rural and Urban health, Medical anthropology of Infectious and Life style diseases with special reference to Tuberculosis, HIV/AIDS Malnutrition, Malaria, Sickle cell Anemia, Diabetes, social determinants of health and health inequalities.

### **Unit IV: Contemporary Issues, Applied Medical Anthropology and Ethics**

(10 hours)

Political economy of health, structural violence, and health inequities in India. Global health, international policies, and their local implications, Applied Medical Anthropology: Role in public health programmes, disaster response, and community health interventions.

### **Practical. (1 Credit – 30 hours)**

The practical component focuses on hands-on training in medical anthropological methods through supervised fieldwork in nearby communities (rural/tribal/urban settlements in Delhi-NCR or during study tours).

1. Preparation of a research proposal on a health-related topic (e.g., ethnomedicine, maternal health, nutrition, or mental health).
2. Participant observation in a healthcare setting (PHC, traditional healer, or hospital OPD) and maintenance of a field diary.
3. Collection and analysis of illness narratives, case studies, and health-seeking behaviour data.

### **Suggested Readings**

1. **Anthropological Survey of India** publications and reports of the National Institute of Health and Family Welfare (NIHFW).
2. **Helman, C.G.** (2007). *Culture, Health and Illness* (5th ed.). Hodder Arnold.
3. **Kleinman, A.** (1980). *Patients and Healers in the Context of Culture*. University of California Press.
4. **McElroy, A., & Townsend, P.K.** (2015). *Medical Anthropology in Ecological Perspective* (6th ed.). Westview Press.
5. **Nichter, M.** (2008). *Global Health: Why Cultural Perceptions, Social Representations, and Biopolitics Matter*. University of Arizona Press.
6. **Quack, J., & Sax, W.S.** (Eds.). (2010). *The Anthropology of Healing*. Orient Black Swan.

## Semester-IV

### DSE-19

#### ANTHROPOLOGICAL PERSPECTIVES ON INDIAN KNOWLEDGE SYSTEMS (IKS)

| Course Title                                                          | Total Credit | Credit distribution |           |
|-----------------------------------------------------------------------|--------------|---------------------|-----------|
| <b>Anthropological perspectives on Indian Knowledge Systems (IKS)</b> | 04           | Theory              | Practical |
|                                                                       |              | 03                  | 01        |

#### Course Objective

- Develop a Critical understanding of the philosophical foundations of HIS including the concepts of "Vidya" (knowledge) and "Jnana" (wisdom) as understood in India.
- Examine & Deconstruct Colonial Narratives through Indian knowledge perspectives.
- Analysing Indian Knowledge System in holistic framework Religion, Science and Ecology

#### Learning Outcomes

- Critically appreciate IKS as systematic, empirical and critically grounded forms of knowledge
- Analyze IKS from anthropological, historical and interdisciplinary perspectives.
- Students' minds should be decolonised so they can recognise Indigenous Knowledge Systems as systematic, empirical, and culturally grounded forms of knowledge.

#### Unit 1 Philosophical Foundations of Indian Thoughts

12 Hours

Philosophical Roots :*Pramanas* in Nyaya School: Debate between folk science and western science; concept of *Vidya and Jnana* in Indian tradition. The anthropology of "Technological Knowledge" among artisanal communities (weaving, metallurgy, and architecture/*Vastu*); (The lost-wax casting (*Dhokra*) of Bastar and the geometry of Ikat weaving).

#### Unit 2: Ethno-Medicine and Indigenous Health Systems

12 Hours

Healing and ethnomedicine, the study of "Non-codified" knowledge systems among Central and North-Eastern tribal communities, Ayurveda and Siddha as local knowledge: Concept of body and health, humors (*Doshas*), and the concept of balance; the Sowa-Rigpa: Himalayan healing traditions.

#### Unit 3: Social Architecture and Knowledge Transmission

11 Hours

Guru-Shishya Parampara: An ethnographic study of lineage-based knowledge transmission (learning by apprenticeship), Orality vs. Literacy: The role of itinerant performers, *Kathas*, and folk theatre (*Yakshagana*, *Nautanki*) in disseminating ethical and social knowledge.

#### Unit 4: Traditional Ecological Wisdom and Sustainable Practices

10 Hours

Sacred Groves (Sarnasthal, *Devrai/Kavu*): Community-managed forest ecosystems and the ritual protection of biodiversity; Traditional Water Management: The anthropology of *Johads*, *Ahars*, and *Stepwells*; collective social action in water conservation, Vedic Agriculture and Ethno-Agronomy; Biopiracy and Traditional Knowledge.

## Practical

1. Case study of a traditional craft, healing practice/ knowledge transmission system.
2. Documentation of an Indigenous knowledge system through ethnographic fieldwork.

## Suggested Reading:

1. **Kakar, Sudhir** (1982), Shamans Mystics and Doctors
2. **Mahadeva,B., Bhat,V.R., and Pavanna R.N.**(2023). Introduction to Indian Knowledge System.PHI learning
3. **Marglin, F.A. and Apffel-Marglin, S.** (1990). *Dominating Knowledge: Development, Culture, and Resistance.*
4. **Saraswati, Baidyanath.** (1993). *Interface of Cultural Identity and Development.* IGNCA
5. **Srinivas, M.N.** (1966). *Social Change in Modern India.* University of California Press.
6. **Uberoi, J.P.S.** (1978). *Science and Culture.* Oxford University Press.
7. **Zimmermann, F.** (1987). *The Jungle and the Aroma of Meats: An Ecological Theme in Hindu Medicine.*

## Semester-IV

### DSE-20

#### Environmental Health

| Course Title and Code | Total Credits | Credit distribution of the course |                     |
|-----------------------|---------------|-----------------------------------|---------------------|
|                       |               | Lecture                           | Practical/ Practice |
| Environmental Health  | 04            | 03                                | 01                  |

#### Course Objective

1. To familiarize students with the fundamental of environmental health concept.
2. To understand the relationships among human activities, the environment, and human health.
3. To emphasize on the activities related with sustainable development

#### Course Learning Outcomes

Students will be able to

1. Elucidate the various environmental hazards that impact human health
2. Understand the concepts of equity and sustainability as fundamental principles in the management of environmental health risks.
3. Evaluate global environmental transformations regarding their causes and the consequences they pose for human health.

#### UNIT-1: Introduction

12 Hours

Environmental hazards; Environmental health equity and inequality; Water and sanitation; Urban health; green infrastructure; household energy and health; Climate change and sustainable development; Dose-response relationship, one health approach and ecosystem health.

#### UNIT-2: Pollution, Noise, WASH and Climate change

12 Hours

Air/Water/Noise pollution, their health effects; health impacts and actions/interventions/policies on air pollution, WASH and climate change, National Clean Air Program; Pradhan Mantri Ujjwala Yojana. Exposure assessment methods.

#### UNIT-3: Food, Chemicals, Biodiversity, Radiation, solid waste

11 Hours

Safe and healthy food Practices. POSHAN Abhiyan; Food toxicity, Bio-social diversity, ecosystems and health; and transport, mobility and physical activity; Chemicals in the environment, health impacts and actions/interventions/policies on chemicals, radiation and solid waste including electronic waste, chemical risks assessment and management

#### UNIT-4: Social Environments and Biological Impacts

10 Hours

Occupational and workplace health; Healthy Cities/urban settlements; Housing; and health care facilities; Quality of life; Smart Cities Mission; Cultural resilience and Sustainable development

## **Practical**

1. Documentation of air, water or solid waste management practices.
2. Prepare a project report on topics related to environment and public health.
3. House hold survey on water, sanitation and hygiene (Wash) Practices.
4. GIS and Mapping –Preparation of a community environmental health map, Mapping water resources, disposal sites, pollution hotspots.

## **Suggested Readings**

1. Ray M. Merrill. Environmental Epidemiology: Principles and Methods (Jones & Bartlett Learning) (2008)
2. Dean Baker and Mark J. Nieuwenhuijsen. Environmental Epidemiology: Study Methods and Application (2008)
3. Howard Frumkin. Environmental Health: From Global to Local. Jossey-Bass (John Wiley & Sons), 2016 (3rd Edition)
4. Robert H. Friis. Essentials of Environmental Health. Jones & Bartlett Learning, 2018 (3rd Edition)
5. Barry S. Levy et al. Occupational & Environmental Health. Oxford University Press, 2017

## **Keywords**

Exposure, Dose-response, Environment, Ecology, health policy, Disease, Biological effects

**Semester-IV**  
**DSE-21**  
**Fieldwork-based Project**

| Course Title and Code   | Total Credits | Lecture | Practical | Tutorial | Eligibility                        |
|-------------------------|---------------|---------|-----------|----------|------------------------------------|
| Fieldwork-based Project | 04            | 0       | 04        | 00       | UG in Anthropology / Life Sciences |

**COURSE OBJECTIVES:** This course provides intensive training in anthropological fieldwork, research design, data collection, analysis, interpretation, and scientific writing across any one of the courses they selected previously. The final fieldwork topic will depend on departmental approval.

1. To develop competency in anthropology fieldwork, research design and data collection.
2. integrates theoretical knowledge with practical research experience through supervised independent field-based research in anthropology.
3. To apply qualitative and quantitative research methods in anthropological settings.

**LEARNING OUTCOMES**

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

1. Design and conduct independent anthropological research.
2. Apply qualitative and quantitative field methods in anthropology.
3. Develop skills in participant observation, interviewing, survey design, and ethnographic documentation.
4. Collect, organise, and analyse field data systematically.

**COURSE CONTENT:** **Fieldwork-based Project** provides advanced training in anthropological research through intensive field-based investigation and independent project work. The course integrates theoretical knowledge with practical experience in research design, ethnographic methods, data collection, analysis, interpretation, and scientific writing. It emphasises participant observation, interviewing, documentation, ethical research practices, and community engagement across diverse anthropological settings. Students undertake supervised field research in areas such as biological anthropology, primatology, archaeology, medical anthropology, human ecology, and socio-cultural anthropology. . The student is expected to independently design a research proposal, formulate research objectives, describe the methods to be employed, conduct fieldwork for data collection, document observations and events, manage and organise collected data, and outline the proposed statistical and analytical approaches to be implemented in the project. The course

culminates in the submission of a dissertation/project report and oral presentation, fostering analytical, methodological, and professional skills essential for academic and applied anthropological research

### **Fieldwork Requirements**

- Each student shall undertake independent or supervised field-based research.
- Fieldwork may be conducted in rural, urban, tribal, archaeological, biological, medical, ecological, or applied anthropology settings.
- Students shall maintain detailed field notes and submit periodic progress reports.
- Minimum field engagement duration shall be decided by the Department.
- Submission of dissertation/project report is mandatory.

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### **Assessment Methods**

| Component                                    | Weightage |
|----------------------------------------------|-----------|
| <b>Research Proposal and Review</b>          | 10%       |
| <b>Fieldwork Performance and Field Diary</b> | 25%       |
| <b>Data Analysis and Interpretation</b>      | 20%       |
| <b>Dissertation/Project Report</b>           | 30%       |
| <b>Presentation and Viva Voce</b>            | 15%       |

**Areas of Research:** Any of the courses the student has opted for in their final year

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## Semester-IV

### GE-5

#### Anthropology of Cultural Heritage

| Course Title and Code             | Total Credits | Credit Distribution of the Course |           |
|-----------------------------------|---------------|-----------------------------------|-----------|
|                                   |               | Lecture                           | Practical |
| Anthropology of Cultural Heritage | 04            | 03                                | 01        |

#### Course Objectives

1. To introduce students to the conceptual and theoretical foundations of cultural heritage from an anthropological perspective.
2. To explore heritage practices, archaeological contributions, and institutional frameworks at global and local levels.
3. To train students in basic heritage practices such as documentation, preservation, interpretation, and display.

#### Learning Outcomes: Upon completion of this course, students will be able to:

1. Define and distinguish between tangible, intangible, and natural heritage.
2. Understand the role of archaeology in heritage practices and its link to culture and politics.
3. Apply heritage documentation and conservation techniques and critically evaluate heritage-related issues, including power dynamics, tourism, and conflicts.

#### Course Content

##### Unit I: Understanding Heritage

**12 Hours**

Conceptualising 'heritage', Types/ Tangible, intangible, and natural heritage;

History and development of heritage studies;

Archaeology and Heritage; sites, objects, practices ;

UNESCO Heritage sites;

Heritage as a resource and commodity: experiences and souvenirs;

Tourism and natural heritage: impact, opportunities and challenges;

Eco-tourism and sustainable approaches to heritage;

##### Unit II: Conservation, Museums, and Display

**12 Hours**

Evolution of museums and their role in heritage

Acquisition, management, and conservation of collections

Exhibition, display, and cultural representation

Challenges in cross-cultural conservation

**Unit III: Historical and Socio-Political Dimensions of Heritage**

**11 Hours**

Colonialism and the documentation of material culture

Heritage as a tool of both domination and resistance; Heritage regimes and discourses

Nationalism and heritage

Debates on global heritage and representation; heritage, belonging and identity.

Debates on the repatriation of cultural property and restitution

**Unit IV: Heritage, in India**

**10 Hours**

India's history of cultural and heritage preservation

Overview of India's current policies on cultural and heritage preservation

Implications of India's current policies on cultural and heritage preservation

Examples of tangible and intangible heritage in India

Examples of natural heritage in India

Challenges in the conservation of Indian culture

**Practical**

**30 Hours**

1. Field documentation of local heritage (tangible/intangible/natural)
2. Analysis of heritage sites and artefacts using anthropological tools
3. Simulated heritage exhibition: design and interpretive strategies
4. Policy review: comparison of heritage policies (e.g., India, UNESCO)

**Core Readings**

1. Boylan, P. (Ed.). (2004). *Running a Museum: A Practical Handbook*. Paris: ICOM.
2. Harrison, R. (2010). *Understanding the politics of heritage*. Manchester University Press.
3. Labadi, S. (2007). Representations of the nation and cultural diversity in discourses on world heritage. *Journal of Social Archaeology*, 7(2), 147–170.
4. Meskell, L. (Ed.). (2015). *Global Heritage: A Reader*. Wiley-Blackwell.
5. Pearce, S. (1994). Objects as meaning; or narrating the past. In Pearce, S. (Ed.), *Interpreting Objects* (pp. 19–29). New York: Routledge.

**Suggested Readings**

1. Appiah, K. A. (2006). "Whose Culture Is It?" *New York Review of Books*.
2. Clifford, J. (1988). *The Predicament of Culture*. Harvard University Press.
3. Arnold, B. (1999). The contested past. *Anthropology Today*, 15(1), 1-4.  
<https://doi.org/10.1111/1467-8322.00041>

4. Harvey, D. C. (2001). Heritage pasts and heritage presents: Temporality, meaning and the scope of heritage studies. *International Journal of Heritage Studies*, 7(4), 319–338. <https://doi.org/10.1080/13581650120105534>
5. Hoskins, J. (1997). *Biographical Objects: How Things Tell the Stories of People's Lives*. New York: Routledge.
6. Pedersen, A. (2002). *Managing Tourism at World Heritage Sites: A Practical Manual for World Heritage Site Managers*. UNESCO World Heritage Centre.

**Keywords:** Heritage, Archaeology, Tangible and Intangible Culture, Museums, Repatriation, Cultural Policy, Conservation, World Heritage, Tourism, Colonialism, Display Practices.

**Sem-IV****GE-6****Society and Culture in Vedic Times**

| Course Title and Code                                             | Total Credits | Credit distribution of the course |           |
|-------------------------------------------------------------------|---------------|-----------------------------------|-----------|
|                                                                   |               | Lecture                           | Practical |
| <b>Society and Culture in Vedic Times</b><br>(Vedic Anthropology) | <b>04</b>     | <b>03</b>                         | <b>01</b> |

**Course Objectives**

1. To understand the foundations of society and culture in Vedic times
2. To explore human societies, cultures, civilizations, ethics, and traditions through Vedic sources
3. To compare Vedic and modern anthropological perspectives.

**Learning Outcomes**

1. To appreciate the Vedic knowledge for maintaining the social harmony
2. To gain interdisciplinary research qualities integrating anthropology, history, ethics, philosophy etc.
3. To conduct basic research on Vedic traditions

**Syllabus (Theory)****Unit-I: Introduction to Society and Culture in Vedic Times****12 Hours**

Nature of Vedic texts; Outline and exploration of Vedic Sources: Vedas, Upanishads, Puranas, Itihasas, Smritis; Vedic views on Human Evolution vs. Scientific Theories; Four Yugas (Satya, Treta, Dwapara, Kali) as a Timeline for Civilizational Growth; Vedic Society; Role of Women: Gargi, Maitreyi, Lopamudra, and Sulabha's contributions

**Unit-II: Ethics, Morality, and Law****12****Hours**

Dharma, Artha, Karma, Moksha as Ethical Foundations; Concept of Rita (Cosmic Order) and Nyaya (Justice); Vedic Principles of Governance and Kingship; Comparative Analysis of Vedic Ethical Systems

**Unit-III: Rituals, Culture, and Traditions****11 Hours**

Yajnas and their socio-cultural significance; Samskaras (Rites of Passage) – Birth to Death; Festivals and their Anthropological Relevance; Vedic Concept of Art, Music, and Architecture

**Unit-IV: Environment and Nature in Vedic Thought****10 Hours**

Vedic concept of Ecology and Sustainability; Sacred Rivers, Forests and animals in Hindu Tradition; Relevance of Ayurveda and traditional healing

**Practical****30 Hours**

Project report based on data collection related to Vedic knowledge, Samskaras, Art, Music, and Architecture

**Core Readings**

1. Griffiths, A., & Houben, J. E. (2004). The Vedas. *Text, Language and Ritual*.

2. Vivekananda, S., & Madhurananda, S. (2016). *Bhagavad Gita as viewed by Swami Vivekananda*. Advaita Ashrama (A publication branch of Ramakrishna Math, Belur Math).
3. Manusmriti – Ethics & Social Order
4. *Ranchor Prime* (1996). *Hinduism and ecology: Seeds of truth*. Motilal Banarsidass Publishing House.
5. Basham, A. L., & Rizvi, S. A. A. (1956). *The wonder that was India*. London: Sidgwick and Jackson.

### **Suggested Readings**

1. Medhananda, S. (2021). Swami Vivekananda's vedāntic cosmopolitanism. Oxford University Press.
2. Swami Vivekananda's Views on Vedic Wisdom in the Modern Age
3. Introduction to the Vedas – Swami Dayananda
4. Selections from Manusmriti
5. Gargi & Maitreyi in the Upanishads
6. Bhagavad Gita – Teachings on Dharma
7. Arthashastra on Law and Governance
8. Taittiriya Upanishad – Rites & Rituals

### **Keywords**

Vedas, Yugas, Ashramas, Yajnas, Ethics, Morality.

**Semester-IV****SEC-3****Anthropology of Tourism**

| Course Title and Code   | Total Credits | Credit distribution of the course |           |
|-------------------------|---------------|-----------------------------------|-----------|
|                         |               | Lecture                           | Practical |
| Anthropology of Tourism | 02            | 01                                | 01        |

**Course Objectives**

1. The first objective is to understand the perspectives on tourism and engagement of different stakeholders at various institutions for developing sustainable tourism.
2. The second objective is to study how tourism could be understood in different lenses
3. The third objective is to understand about the importance of community participation, livelihood and tourism, impact of globalization on tourism etc.

**Learning Outcomes**

1. By studying, we will understand the concept and approaches of anthropology of tourism, commitment of anthropologist in developing sustainable tourism policy research and policy formulation, etc.
2. Know the significance of tourism in maintaining the well-being of the society
3. Examine the problems of contemporary program and policies for developing tourism in the county.

**Syllabus (Theory)**

**Unit I:** Nature and Scope, Evolution of concept **12 Hours**

**Unit II:** Theories and Models of studying Tourism **12 Hours**

**Unit III:** Anthropology and Tourism Interfaces, Guest and Host, Globalization, Sustainable Tourism, Constitutional Provision, Gender and Tourism **11 Hours**

**Unit IV:** Trends in Anthropology, Role of Anthropology in Tourism, Community Development, Agencies, Problem and Prospects **10 Hours**

**Keywords:** Tourism, Development, Globalization, Guest and Hosts

**Practical**

1. Prepare a project based on any contemporary issues relating tourism and public policy, community participation and tourism, heritage tourism by employing various sources viz. books, journals, magazines, government reports newspaper articles, etc.
2. Presentation of the project and group discussion

### Core Readings

1. Bruner P M. 1999. An Introduction to Tourism and Anthropology. London. Routledge Middleton- Victor T.C. 1994. Marketing in Travel and Tourism, Oxford
2. McIntosh, Goldner, Ritchie. 1995. "Tourism: Principles, Practices, Philosophy"- John Wiley, New York, 1995
3. Naomi M. Leite, Quetzil E. Castañeda, Kathleen M. Adams. 2019. The Ethnography of Tourism: Edward Bruner and Beyond. Rowman & Littlefield
4. Smith V. ed. 1989. Hosts and Guests: The Anthropology of Tourism. Philadelphia: Univ. Penn. Press. 2nd ed.
5. Stronza Amanda. 2001. Anthropology of Tourism: Forging New Ground for Ecotourism and Other Alternatives. Annu. Rev. Anthropol. 2001. 30: 261-83

<https://www.csu.edu/cerc/researchreports/documents/ANTHROPOLOGYofTOURISMForgingNewGroundForEcotourism.pdf>

### Suggested Readings

1. Chambers E. 1997. Tourism and Culture: An Applied Perspective. New York: State Univ. NY
2. Cohen E. 1984. The Sociology of tourism: approaches, issues and findings. Annu. Rev. Sociol. 10:373-92
3. Eadington WR, Smith VL. Ed. 1992. Tourism Alternatives: Potentials and Problems in the Development of Tourism. Philadelphia: Univ. Penn. Press.
4. Swain MB. 1995. Gender in Tourism. Ann. Tour. Res. 22: 247-66

## Semester-IV

### SEC-4 One Health

| Course Title and Code | Total Credits | Credit distribution of the course |                     |
|-----------------------|---------------|-----------------------------------|---------------------|
|                       |               | Lecture                           | Practical/ Practice |
| One Health            | 02            | 01                                | 01                  |

#### Course Objective

- To understand the strong connections among human, animal, and environmental health necessitate effective collaboration, communication, and coordination among the pertinent sectors.

#### Course Learning Outcomes

- Students will be able to apply the One Health approach to enhance the health of humans, animals, and ecosystems by integrating these domains instead of treating them as distinct entities.

#### Syllabus (Theory)

##### UNIT-1: Introduction

**20 Hours**

One Health One Medicine Concept. Disease detection, identification, and monitoring in public health, as well as the deficiencies in current health system approaches, and the critical role of genome sequencing. Cross species boundaries by pathogens and the transmission of emerging infectious diseases, along with their significance.

##### UNIT-2: One Health Epidemiology, Preparedness, Media & Community Engagement

**25 Hours**

Unification of human, animal, and ecosystem health in the management and prevention of diseases. Community involvement in the control of zoonotic diseases affecting both humans and animals through the One Health approach. A Rapid Response system, along with Disaster Management and Outbreak Investigation Plans. Risk Communication and Pandemic Preparedness. cohesive policy to tackle the common health threats posed by humans and animals. utilization of various media types for communication and the influence of media on public perceptions regarding disease.

#### Practical

**30 Hours**

Prepare a project report on a topic related to One health by collecting real data from the field area. It will include study designing, data collection, analyses and report writing. OR Engaging with Public or Community on One Health-related topic.

#### Core readings

- Joana C. Prata. One Health: Integrated Approach to 21st Century Challenges to Health – Academic Press (Elsevier), 2022.

2. Mackenzie JS, Jeggo M, Daszak P, Richt JA, editors. One Health: The Human-Animal-Environmental Interfaces in Emerging Infectious Diseases: The Concept and Examples of a One Health Approach (Current Topics in Microbiology and Immunology). Springer; 2013
3. One Health the Theory and Practice of Integrated Health Approaches 2020 Edition by Jakob Zinsstag, Esther Schelling, CABI Publishing
4. Craig Stephen & Colleen Duncan. Climate Change and Animal Health (CRC One Health One Welfare Book Series), CRC Press, 2022.
5. Sharon E. Madigan. Introduction to One Health: An Interdisciplinary Approach to Planetary Health. Blackwell Pub, 2019.

### **Keywords**

One health, zoonotic disease, disaster management, pandemic management

| Curriculum Structure of 2nd Year of PG for Two years PG Programme (3+2) OR       |            |        |                                                                                       |         |  |                                                                                  |        |                                                                                       |         |
|----------------------------------------------------------------------------------|------------|--------|---------------------------------------------------------------------------------------|---------|--|----------------------------------------------------------------------------------|--------|---------------------------------------------------------------------------------------|---------|
| One Year PG Programme After Completion of Four-Year UG Programme (4+1)           |            |        |                                                                                       |         |  |                                                                                  |        |                                                                                       |         |
| Structure-2 Level-6.5): PG Curriculum Structure Course Work with research type   |            |        |                                                                                       |         |  |                                                                                  |        |                                                                                       |         |
| Level-6.5                                                                        | Year-2     |        |                                                                                       |         |  | Year-2                                                                           |        |                                                                                       |         |
|                                                                                  |            |        | Paper                                                                                 | Credits |  |                                                                                  |        | Paper                                                                                 | Credits |
|                                                                                  | Semester-3 | DSC-7  | Fieldwork Tradition in Anthropology                                                   | 4       |  | Semester-4                                                                       | DSC-9  | Palaeoanthropology                                                                    | 4       |
|                                                                                  |            | DSC-8  | Primatology                                                                           | 4       |  |                                                                                  | DSC-10 | Tribal India                                                                          | 4       |
|                                                                                  |            |        |                                                                                       | 8       |  |                                                                                  |        |                                                                                       | 8       |
|                                                                                  |            |        |                                                                                       |         |  |                                                                                  |        |                                                                                       |         |
| Students can OPT for either 2 New DSEs, OR 1 New DSEs & 1 GE from the list below |            |        |                                                                                       |         |  | Students can OPT for either 2 New DSEs, OR 1 New DSEs & 1 GE from the list below |        |                                                                                       |         |
|                                                                                  |            | DSE-5  | Molecular Anthropology                                                                | 4       |  |                                                                                  | DSE-14 | Anthropology of Public Policy                                                         | 4       |
|                                                                                  |            | DSE-6  | Physiological Anthropology                                                            |         |  |                                                                                  | DSE-15 | Kinanthropology                                                                       |         |
|                                                                                  |            | DSE-7  | Anthropology of Religion                                                              |         |  |                                                                                  | DSE-16 | Psychological Anthropology                                                            |         |
|                                                                                  |            | DSE-8  | Anthropology of Gender                                                                |         |  |                                                                                  | DSE-17 | Genetic Epidemiology                                                                  |         |
|                                                                                  |            | DSE-9  | Linguistic Anthropology                                                               |         |  |                                                                                  | DSE-18 | Medical Anthropology                                                                  |         |
|                                                                                  |            | DSE-10 | Economic Anthropology                                                                 |         |  |                                                                                  | DSE-19 | Anthropological perspective on Indian Knowledge System                                |         |
|                                                                                  |            | DSE-11 | Political Anthropology                                                                |         |  |                                                                                  | DSE-20 | Environmental Health                                                                  |         |
|                                                                                  |            | DSE-12 | Anthropology of Development                                                           |         |  |                                                                                  |        |                                                                                       |         |
|                                                                                  |            |        |                                                                                       |         |  |                                                                                  |        |                                                                                       |         |
|                                                                                  |            |        |                                                                                       |         |  |                                                                                  |        |                                                                                       |         |
|                                                                                  |            | GE-3   | Indian Prehistory                                                                     | 4       |  |                                                                                  | GE-5   | Anthropology of Cultural Heritage                                                     | 4       |
|                                                                                  |            | GE-4   | Anthropology of North East India                                                      |         |  |                                                                                  | GE-6   | Society and Culture in Vedic Times                                                    |         |
|                                                                                  |            |        |                                                                                       | 8       |  |                                                                                  |        |                                                                                       | 8       |
|                                                                                  |            |        | <b>Dissertation (Original Work)</b>                                                   |         |  |                                                                                  |        | <b>Dissertation (Original Work)</b>                                                   |         |
|                                                                                  |            |        | Dissertation based on fieldwork of at least four weeks in tribal/ village communities | 6       |  |                                                                                  |        | Dissertation based on fieldwork of at least four weeks in tribal/ village communities | 6       |
|                                                                                  |            |        |                                                                                       | 22      |  |                                                                                  |        |                                                                                       | 22      |

## Semester III

### Discipline Specific Core (DSC-7)

#### Fieldwork Tradition in Anthropology

| Course Title                        | Total Credit | Credit distribution |           |
|-------------------------------------|--------------|---------------------|-----------|
| Fieldwork Tradition in Anthropology | 04           | Theory              | Practical |
|                                     |              | 03                  | 01        |

**Total Teaching Hours:** Theory – 45 hours (3 hours/week); Practical – 30 hours (2 hours/week)

#### Introduction

Fieldwork is central to anthropology, marked by immersive engagement with communities. This course reviews the development of fieldwork from early ethnography to current practices, especially in India. Students will study foundational works and new approaches while gaining both theoretical and practical skills for independent research.

#### Course Objectives

- Introduce the genesis and history of anthropological fieldwork, with a focus on India.
- Analyze contributions from pioneering anthropologists on fieldwork tradition
- Highlight ethical, epistemological, and practical challenges of fieldwork in diverse cultural settings.
- Guide students in designing and performing small-scale fieldwork exercises.

#### Learning Outcomes

By course end, students will:

- Explain the evolution and relevance of fieldwork in anthropology.
- Apply suitable fieldwork methods in varied social contexts.
- Critically evaluate ethnographic studies and their theoretical significance.
- Recognize and address ethical concerns in field research.
- Plan and conduct basic fieldwork and present the findings systematically in the form of a report.

**Keywords:** Participant observation, Ethnography, Intensive fieldwork, Village and Tribal ethnography, Urban setting, Reflexivity, Research ethics, Field diary, Rapport, Multi-sited ethnography, Decolonizing methodology

#### Syllabus (Theory)

#### Unit I: Historical Foundations of Fieldwork Tradition

Emergence of fieldwork tradition in anthropology: Armchair anthropology, Torres Strait and Baffinland expedition. Early Indian Fieldwork tradition. The colonial census, Gazetteers, and the formative works of S.C. Roy (Monographic approach) and L.K. Ananthakrishna Iyer (Encyclopedic approach). Growth fieldwork in India D.N. Majumdar, M.N. Srinivas, S.C. Dube and others. Fieldworker and the Field: Challenges of caste, kinship, gender, and power dynamics in fieldwork; insider-outsider perspectives. **11 hours**

**Unit II Fieldwork in cross-cultural Context** Tribal fieldwork traditions: issues of isolation, integration, and rights, Rural/village studies India: Restudies”; caste, jajmani, dominance, and change. Fieldwork in urban slums, cities, migrant communities, and industrial settings. Studies of ethnicity, class, and **11 hours**

### **Unit III: Fieldwork, Ethics and Emerging Trends**

Malinowskian Diary and Post-modern turn in Fieldwork. Reflexivity, positionality, and decolonizing fieldwork; reciprocity, power relations, representation, and “Challenges in the field: Safety, Gender issues and Political sensitivities. New directions in Fieldwork: Digital ethnography, sensory methods, and public anthropology in India. **12 hours**

### **Unit IV: Fieldwork and Theory**

Scientific Treaties (Malinowski and Radcliffe-Brown), Historiographic accords (Evans-Prichard), Actor Center and Processual approaches, Meaning centered, literary, interpretive turn: Clifford Geertz; Victor Turner and Mary Douglas **11 hours**

### **Practical: (1 Credit – 30 hours)**

The practical component aims to provide hands-on training in fieldwork skills. Students will undertake supervised short-term fieldwork (individual or group) in a nearby rural/tribal/urban community (preferably in Delhi-NCR or during study tours).

### **Activities:**

- Preparation of a field research proposal (including ethics clearance simulation).
- Participant observation and field note writing (minimum 7–10 days of immersion).
- Collection of genealogies, social mapping, and at least one life history/case study.
- Maintenance of a reflective field diary.
- Data organization, preliminary analysis, and presentation of a short field report (written + seminar).
- Training in basic tools: Photography, audio recording (with consent), and simple coding of qualitative data.

**Evaluation:** Field report (50%), Viva-voce (25%), Class participation & diary (25%).

### **Suggested Readings**

1. **Béteille, A., & Madan, T.N. (Eds.). (1979).** *Encounter and Experience: Personal Accounts of Fieldwork*. Vikas Publishing.
2. **Furer-Haimendorf, C. von and Verrier Elwin** (Various works on Indian tribes).

3. **Gupta, A., & Ferguson, J. (Eds.). (1997).** *Anthropological Locations: Boundaries and Grounds of a Field Science*. University of California Press.
4. **Levi-Sanchez, S. (2026).** *Fieldwork as craftwork: A practical guide for conducting research in the real world*. Bloomsbury Publishing.
5. **Majumdar, D.N. (1958).** *Caste and Communication in an Indian Village*. Asia Publishing House.
6. **Malinowski, B. (1922).** *Argonauts of the Western Pacific*. Routledge.
7. **Malinowski, B.** *A Diary in the Strict Sense of the Term*. Translated by Norbert Guterman. Stanford: Stanford University Press, 1989. First published 1967 by Harcourt, Brace & World.
8. **Srinivas, M.N. (1976).** *The Remembered Village*. Oxford University Press.
9. **Srinivas, M. N., Shah, A. M., & Ramaswamy, E. A. (Eds.). (2002).** *The fieldworker and the field: Problems and challenges in sociological investigation* (2nd ed.). Oxford University Press.
10. **Srivastava, V.K. (Ed.). (2004).** *Methodology and Fieldwork*. Oxford University Press.
11. **Additional readings:** Works by S.C. Dube, Oscar Lewis (restudy), Breman, Parry, and contemporary urban ethnographers like Sanjay Srivastava (*Entangled Urbanism*)

**Semester-III**  
**Discipline Specific Core (DSC-8)**  
**Primateology**

| Course Title and Code | Total Credits | Lecture   | Practical | Tutorial | Eligibility                                  |
|-----------------------|---------------|-----------|-----------|----------|----------------------------------------------|
| <b>Primateology</b>   | <b>04</b>     | <b>03</b> | <b>01</b> | <b>0</b> | <b>UG in Anthropology/<br/>Life Sciences</b> |

**Primateology** occupies a foundational position in biological anthropology, providing systematic and comparative knowledge of our closest living relatives and an indispensable evolutionary framework for understanding the origins of human sociality, cognition, and behaviour. This course offers an advanced, integrative treatment of primate behavioural ecology, social organisation, cognition, communication, and conservation biology. A sustained emphasis on South Asian and Indian primates, one of the most diverse primate assemblages in the world, runs throughout the course, and students are introduced to the ethnoprimateological traditions, human-primate interface issues, and wildlife conservation frameworks specific to the Indian context, including relevant perspectives from Indian Knowledge Systems.

### **COURSE OBJECTIVES**

1. To provide an advanced understanding of primate social organisation, behavioural ecology, and life history variation, situating these within rigorous evolutionary and socioecological theoretical frameworks.
2. To develop critical engagement with contemporary research on primate cognition, communication, and cultural transmission, and to assess their implications for understanding human behavioural evolution.
3. To examine the conservation challenges facing non-human primates, with particular reference to Indian and South Asian species, and to explore the intersections of ethnoprimateology, human-wildlife conflict, and the One Health framework.

### **LEARNING OUTCOMES**

By the end of this course, students will be able to:

1. Apply socioecological models and evolutionary theory to explain variation in primate social systems, mating strategies, and life history parameters across major taxonomic groups, with particular reference to Indian primates.
2. Critically evaluate empirical and theoretical research on primate cognition, communication, and social learning, and assess the comparative relevance of primate data for understanding human behavioural evolution.
3. Design and execute a structured behavioural observation study using standard field methodology, including focal animal sampling, scan sampling, and ethogram construction, and analyse and report on observational data systematically.
4. Assess the conservation status of Indian primate species, engage with ethnoprimateological perspectives and primates in Indian cultural and Knowledge System traditions, and critically analyse the dynamics of human-primate coexistence.

## **COURSE CONTENT**

### **Unit I: Primate Ecology, Morphology, and Diversity**

**12 hours**

History and scope of primatology; key contributors including Solly Zuckerman, C. Ray Carpenter, Jane Goodall, Dian Fossey, Birutė Galdikas, and P. K. Seth. Taxonomy of primates: Strepsirrhini, Haplorrhini, Platyrrhini, Catarrhini, and major families. Morphological adaptations: dentition, locomotion, sensory systems. Dietary ecology: feeding strategies and digestive adaptations. Habitat ecology: ranging, activity, niche use. Distribution, diversity, and conservation status of Indian primates.

### **Unit II: Primate Social Organisation and Behavioural Ecology**

**12 hours**

Socioecological models and their theoretical lineage, linking food distribution with female spatial organisation and male mating strategies. Primate social systems, including solitary, pair-bonded, uni-male polygynous, multi-male multi-female, fission-fusion, and multi-level societies, with Indian and global case studies. Female strategies: contest and scramble competition, dominance hierarchies, matrilineal kinship, allomothering, and cooperative care. Male strategies: competition, coalitions, rank acquisition, infanticide, counter-strategies, and male-female bonds. Sexual selection: mate choice, dimorphism, sperm competition, extra-pair copulations. Life history traits: growth, reproduction, senescence, trade-offs. Dispersal patterns: natal dispersal, philopatry, sex bias, kin competition, and nepotism.

### **Unit III: Primate Cognition and Communication**

**11 hours**

Theoretical frameworks for primate intelligence, including Social Brain and ecological models. Primate archaeology: culture, cognition, and adaptation; tool use and material culture, such as chimpanzee nut-cracking and termite-fishing traditions, and stone tool use in macaques and capuchins. Primate communication: vocal, visual, olfactory, and tactile systems. Ape language research: American Sign Language and Lexigram Studies (Case Studies: Washoe; Koko). Social learning, cultural transmission, and primate self-awareness, metacognition, and prospective cognition. Stone tool knapping behaviour and toolkit production in primates, with experimental evidence from Kanzi demonstrating lithic-making abilities.

### **Unit IV: Conservation Biology and Ethnoprimateology**

**10 hours**

Global and Indian conservation status of non-human primates, including IUCN Red List assessments and major threats such as deforestation, agriculture, hunting, trade, climate change, and disease. Ethnoprimateology and human–primate interfaces; primates in Indian Knowledge Systems, cultural traditions, and ritual ecology, including temple macaques, commensalism, taboos, and folk knowledge. Human–wildlife conflict, crop raiding, and mitigation; urban macaques. Zoonotic diseases, the One Health framework, and the ethics of primate research, including field and captive guidelines.

## PRACTICAL

**30 hours**

1. **Indian Primate Identification Exercise:** Identification of 25 Indian primate species from specimen photographs, diagnostic pelage characteristics, dental formulae, and morphological traits; preparation of annotated species data sheets including habitat, distribution, diet, and IUCN status.
2. **Non-human Primate Osteology:** Identification, labelling, and comparative measurement of primate skeletal specimens: cranium, mandible, dentition, femur, humerus, and pelvis, against human specimens; tabulation of key morphological differences and discussion of their functional and evolutionary significance.
3. **Ethogram Construction and Video-based Behavioural Sampling:** Using documentary footage of non-human primate species, students (a) construct a standardised, mutually exclusive and exhaustive ethogram for a selected species; (b) conduct focal animal sampling and instantaneous scan sampling on video sequences; (c) compute inter-observer reliability coefficients (Cohen's Kappa); and (d) produce a brief written analysis of the resulting behavioural data.
4. **Field Observation at a Zoological Park or Wildlife Sanctuary** (e.g., *National Zoological Park, Delhi*): Students collect structured behavioural data on a target primate species over a minimum of three hours using a pre-designed ethogram and approved sampling protocol. A field data report of not more than 1500 words, including methods, results, and discussion, is submitted for evaluation.
5. **Conservation Mapping and Status Assessment:** Using IUCN Red List, Wildlife Institute of India, and National Biodiversity Authority databases, students map the distribution, threat category, and Protected Area coverage of Indian primate species; findings are presented as an annotated map with a written commentary analysing the major threats and conservation gaps for two selected species.

## Core Readings

1. Strier, K. B. (2017). *Primate Behavioral Ecology* (5th ed.). Routledge/Pearson.
2. Fleagle, J. G. (2013). *Primate Adaptation and Evolution* (3rd ed.). Elsevier Academic Press.
3. van Schaik, C. P. (2016). *The Primate Origins of Human Nature*. Wiley-Blackwell.
4. Campbell, C. J., Fuentes, A., MacKinnon, K. C., Bearder, S. K., & Stumpf, R. M. (eds.) (2011). *Primates in Perspective* (2nd ed.). Oxford University Press.
5. Fuentes, A. (ed.) (2017). *The International Encyclopedia of Primatology*. John Wiley & Sons.
6. Setchell JM, Curtis DJ, eds. *Field and Laboratory Methods in Primatology: A Practical Guide*. 2nd ed. Cambridge University Press; 2011.

## Suggested Readings

1. Mitani, J. C., Call, J., Kappeler, P. M., Palombit, R. A., & Silk, J. B. (eds.) (2012). *The Evolution of Primate Societies*. University of Chicago Press.
2. Janson, C. (2000). Primate socio-ecology: The end of a golden age. *Evolutionary Anthropology*, 9(2): 73-86.
3. Fuentes, A. (2010). Natural cultural encounters in Bali: Monkeys, temples, tourists, and ethnoprimateology. *Cultural Anthropology*, 25(4): 600-624.
4. Shumaker, R. W., Walkup, K. R., & Beck, B. B. (2024). *Animal tool behavior: the use and manufacture of tools by animals*. JHU Press.

**Note:** Additional readings will be given based on specific case studies and lecture topics during the course.

### TEACHING LEARNING PROCESS

1. Classroom lectures supported by multimedia resources, including documentary footage, field photographs, and species identification materials.
2. Seminars and structured discussions drawing on current research from the *American Journal of Primatology*, *International Journal of Primatology*, *Primates*, and *Folia Primatologica*.
3. Structured practical sessions combining laboratory osteology, video-based ethogram training, and conservation data mapping using IUCN and WII databases.
4. Field visit to a zoological park or wildlife sanctuary for direct behavioural observation and structured data collection.
5. Student presentations on assigned Indian primate species or conservation case studies, integrating library research and secondary data.

### ASSESSMENT METHODS

Theory Examination and Continuous Assessment through practicals, field data report, conservation mapping exercise, and seminar participation.

**Keywords:** *Primatology, Socioecology, Primate Behaviour, Ethnoprimateology, Indian Primates, Conservation Biology, Primate Cognition, Behavioural Field Methods, South Asian Primates, Monkey, Ape*

**Semester-III**  
**DISCIPLINE SPECIFIC ELECTIVES (DSE-5)**  
**Molecular Anthropology**

| Course Title and Code         | Total Credits | Credit distribution of the course |           |
|-------------------------------|---------------|-----------------------------------|-----------|
|                               |               | Lecture                           | Practical |
| <b>Molecular Anthropology</b> | <b>04</b>     | <b>03</b>                         | <b>01</b> |

**Course Objectives**

1. To learn basic tenets of molecular anthropology and its applications
2. To understand the genetic structure of human populations based on molecular markers.
3. To learn the types of DNA markers and their utility in genetic analysis.
4. To learn the methods and approaches in ancient DNA research and its limitations.

**Learning Outcomes**

Students will be able to

1. Understand the concepts and terminology used in molecular anthropology
2. Understand the relevance of molecular markers in studying human origin and peopling of India and other populations
3. Learn the methods and techniques used in genetic data generation
4. Appreciate the importance of genetic databases in understanding societies of the past.

**UNIT-I:** Macro and Micro evolution, Concept of molecular evolution, rate of molecular evolution, gene functions, and phenotypic evolution. Human Phylogenetics; Tree reconstruction methods; Applications of phylogenetic studies; Role of culture in shaping human genetic variation. Softwares for molecular genetic analysis. Applications of phylogenetic studies. **12**

**Hours**

**UNIT-II:** Out of Africa Hypothesis; Human Origin: Mitochondrial Eve Hypothesis and its Critical assessment, Haplotypes and Haplogroups, Models of Human origin and migration based on mtDNA and Y-chromosomal markers and Phylogeography: Peopling of India and world populations. Genetic structure of Indian tribal populations. Population structure in India other genetic isolates. **12 Hours**

**UNIT-III:** Classical markers, DNA markers: Restriction fragment length polymorphisms; Polymerase chain reaction; Genotyping and Sequencing Techniques: Single gene, Multiple genes, Whole genome sequencing methods. Population Structure, Multidimensional scaling, principal components analysis. Genome-India Project

**11 Hours**

**UNIT-IV:** Ancient DNA technology: Concepts, Methods and Techniques. Inferences from studies on ancient DNA technology. Examples of Ancient DNA studies and limitations of ancient DNA research. Genetic origin of Indo-European languages and its debate. Indian Ancient DNA research: Roopkund and Rakhigrahi. Critical assessment of Aryan-Invasion debate **10 Hours**

**Practical**

**30 Hours**

Practical (Molecular Anthropology):

- a. DNA Extraction
- b. DNA Quantification
- c. DNA Amplification: Polymerase chain reaction
- d. Electrophoresis
- e. Genotyping and sequencing Techniques

**Keywords:** Human phylogenetics, mt DNA, Y chromosomal region, DNA sequencing

#### **Core Readings**

1. Nei and Kumar. Molecular Evolution and Phylogenetics. (2000)
2. Vogel F. and Motulsky A.G. (2010). Human Genetics: Problems and Approaches. Springer, 3rd revised edition
3. Patrick F. Chinnery, Hans-Jürgen Bandelt, Vincent Macaulay, Martin Richards (eds.). Human Mitochondrial DNA and the Evolution of Homo sapiens. (2006), Springer-Verlag Berlin Heidelberg
4. Jobling, MA Hurles, M and Tyler-Smith, C (2004). Human Evolutionary Genetics, Origins, Peoples and Disease. Garland Science, New York.
5. Chaubey G., Kadian A., Bala S., V. R. Rao. Genetic Affinity of the Bhil, Kol and Gond Mentioned in Epic Ramayana. PLOS ONE 10(7): e0134200.

#### **Suggested Readings**

1. Loh, P. R., et al. (2016). *Local ancestry in admixed populations*. *Genetics*, 192(4), 1515-1530.
2. Cummings MR (2011). Human Heredity: Principles and Issues. Brooks/Cole, Cengage Learning
3. Reece, RJ (2004). Analysis of Genes and Genomes. John Wiley and Sons Ltd, England.
4. Strachan, T and Read, AP (2020). Human Molecular Genetics. Garland Publishing Inc, New York

**Semester-III**  
**DISCIPLINE SPECIFIC ELECTIVES (DSE-6)**  
**Physiological Anthropology**

| Course Title and Code      | Total Credits | Credit distribution of the course |           |
|----------------------------|---------------|-----------------------------------|-----------|
|                            |               | Lecture                           | Practical |
| Physiological Anthropology | 04            | 03                                | 01        |

**Course Objective**

1. To understand the fundamentals of physiological anthropology
2. To understand the concept of physical performance, physiological adaptation and factors influencing adaptation.
3. To learn the relationship between physique and human body composition

**Course Learning Outcomes**

1. Student should understand the fundamentals of physiological anthropology
2. Should understand the concept of physical performance, physiological adaptation and factors influencing adaptation.
3. Student will learn the relationship between physique and human body composition

**Unit 1** Fundamentals of work physiology- homeostasis; metabolism and energy and systems; exercise, respiratory system and haemodynamics (blood pressure, pulse, rate, heart rate, haematocrit, etc)

**12**

**Hours**

**Unit 2** Acute physiological adjustments during transition from resting homeostasis to sub-maximal and maximal exercise and physiological adaptations

**12**

**Hours**

**Unit 3** Cardio-vascular and respiratory endurance, physical working capacity and physical fitness; Reproductive health, regulation of metabolism, growth and energy balance

**11 Hours**

**Unit 4** Physical performance and environmental stress; inter-relationship between physique, body composition and nutrition

**10 Hours**

**Practical**

**30 Hours**

1. Cardiovascular function

- Blood pressure using sphygmomanometer and stethoscope
- Heart rate

- Pulse rate
- 2. Respiratory functions (Static and Dynamic lung functions)
- 3. Physical activity assessment

## **Suggested readings**

### **Unit 1**

Fundamentals of work physiology- homeostasis; metabolism and energy and systems- Exercise Physiology Energy , Nutrition and Human Performance by McArdle , Katch and Katch .Chapter 24(Page 334-341)

Exercise, respiratory system and haemodynamics (blood pressure, pulse, rate, heart rate, heamatocrit, etc) – Exercise Physiology Energy , Nutrition and Human Performance by McArdle , Katch and Katch . Chapter 12(Page 154-167), Chapter 13(Page 168-179) and Chapter 14(Page 180-196)

### **Unit 2**

Acute physiological adjustments during transition from resting homeostasis to submaximal and maximal exercise and physiological adaptations- Exercise Physiology Energy , Nutrition and Human Performance by McArdle , Katch and Katch . Chapter 23(Page 322-333) and Chapter 24(Page 334-353)

### **Unit 3**

Cardio-vascular and respiratory endurance- Exercise Physiology Energy , Nutrition and Human Performance by McArdle , Katch and Katch . Chapter 15(Page 197-209) , Chapter 16(Page 210-218) and Chapter 17(Page 219-233)

Physical working capacity and physical fitness; relationship of body measurements with cardio-vascular and respiratory functions- Physical Activity and Health by C. Bouchard, S.N Blair,W.L Haskell Chapter 3(Page 37-42)

### **Unit 4**

Physical performance and environmental stress; inter-relationship between physique, body composition and nutrition. Exercise Physiology Energy , Nutrition and Human Performance by McArdle , Katch and Katch . Chapter 23(Page 322-333) ,Chapter 26(Page 368-391) and Chapter 27(Page 392-404)

**Semester-III**  
**DISCIPLINE SPECIFIC ELECTIVES (DSE-7)**

**Anthropology of Religion**

| Course Title and Code           | Total Credits | Credit Distribution of the Course |           |          | Eligibility |
|---------------------------------|---------------|-----------------------------------|-----------|----------|-------------|
|                                 |               | Lecture                           | Practical | Tutorial |             |
| <b>Anthropology of Religion</b> | 04            | 03                                | 01        | 0        | PG I        |

**Course Objectives**

1. The present course introduces students to the study of religion as a social phenomenon and a social institution. It aims to encourage students to explore the meaning and essence of religion as an anthropological category, thereby exposing them to the diversity of religious life in a global world order.
2. The course further prepares students to engage with religion in everyday life with a sense of responsibility and to examine its practical links with political, economic, and environmental spheres.
3. It also encourages students to revisit Indian traditions and historical roots by exploring eastern religions such as Hinduism and Buddhism as important foundations of the Indian knowledge system.

**Learning Outcomes**

1. Students will understand the definitional boundaries, theoretical approaches, and methodologies used in the anthropological study of religion in society.
2. Students will be able to examine the construction of religious identities through language, ideology, narratives, and discourse in Indian contexts.
3. Students will understand the relevance of religion and spirituality in medical science and environmental conservation, reflecting the role of religion in the Indian knowledge system.

**Course Content**

**Unit I** —Definitions, theories, and key concepts: supernatural, sacred/profane, totem, magic, rituals, myth, witchcraft and sorcery, rites of passage, and religious specialists. **10 Hours**

**Unit II** — Religion and social dimensions: identity, gender, and environment; religious symbolism and power; world religions and lived religions; economics of religion. **12 Hours**

**Unit III** — Folk and tribal religions; pilgrimage and religious tourism in India; great traditions and little traditions in the Indian context; Indian knowledge systems. **12 Hours**

**Unit IV** — Religious movements and social change; pluralism and secularism; revivalism and conversion; religion, modernity, and globalization. **11 Hours**

**Practical** **30 Hours**

**1. Book Review**

Critical review of an ethnography or monograph on religion, focusing on research questions, methodology, theoretical framework, and key arguments.

## 2. Research Design, Fieldwork, and Report Writing

Formulate a research proposal on a selected theme, conduct short-term fieldwork using appropriate research methods, and prepare and submit a research report.

### Core Readings

- Eller, J. D. (2007). *Introducing anthropology of religion: Culture to the ultimate*. Routledge.
- Madan, T. N. (2011). *India's religions: Perspectives from sociology and history* (2nd ed.). Oxford University Press.
- Srinivas, M. N. (1952). *Religion and society among the Coorgs of South India*. Oxford University Press.
- Vidyarthi, L. P. (1961). *The sacred complex in Hindu Gaya*. Asia Publishing House.

### Suggested Readings

- Evans-Pritchard, E. E. (1940). *The Nuer: A description of the modes of livelihood and political institutions of a Nilotic people*. Clarendon Press.
- Evans-Pritchard, E. E. (1976). *Witchcraft, oracles and magic among the Azande* (E. Gillies, Ed.; Abridged ed.). Oxford University Press. (Original work published 1937).
- Hobgood, L., & Bauman, W. (Eds.). (2018). *The Bloomsbury handbook of religion and nature: The elements*. Bloomsbury Academic.
- McGuire, M. B. (2008). *Lived religion: Faith and practice in everyday life*. Oxford University Press.
- Turner, E. (2005). *Among the healers: Stories of spiritual and ritual healing around the world*. Praeger.

### Teaching-Learning Process

- Classroom Lecture
- Interactive group discussions
- Blackboard and PPT classroom presentations

### Assessment Methods

- Written assignment
- Power point presentation by students
- Class test

**Keywords:** Religion, supernatural, sacred, ritual, symbol, identity, power, pluralism, religious movements, secularism, globalization, modernity

**Semester-III**  
**DISCIPLINE SPECIFIC ELECTIVES (DSE-8)**

**Anthropology of Gender**

| Course Title and Code  | Total Credits | Credit Distribution of the Course |          |
|------------------------|---------------|-----------------------------------|----------|
| Anthropology of Gender | 4             | Lecture                           | Tutorial |
|                        |               | 3                                 | 1        |

**Course objectives**

1. To encourage students to critically deliberate and discuss on the existing debates on women, gender and feminism.
2. To enlighten students about gender rights, gender justice and gender activism, particularly in the Indian context.
3. To motivate students towards gender sensitization and gender empowerment goals.

**Learning outcome**

1. This course will enable students to gain a fundamental understanding of gender and its related concepts & terminologies linking it to debates on sexuality/ sexualities in contemporary discourses.
2. It will help students to think beyond binaries and help students perceive gender both as a social construct and social category, created in and through cultural norms.
3. The students can use reflexive approach to contemplate on gender issues and be aware of gender related social problems in India.

**Syllabus (theory)**

**Unit I-Anthropology of Gender: Introduction:** Basic concepts, definitions and terminologies. Historical and theoretical developments, approaches and orientations to understand gender and related debates in Anthropology. **12 Hours**

**Unit II-** Intersectionality, kinship and power: intersection of gender with kinship structures, race, class, caste, ethnicity. Politics of reproduction, NRT. **10 Hours**

**Unit III: Gender in South Asia-** Gender narratives and performances in south-asian folk traditions, gender division of labour in South Asia, gender politics and activism in south asia; ethnographic studies, Feminism in India. **12 Hours**

**Unit IV: Gender and Globalisation- Impact of global capitalism on gender roles;** Economic perspectives: exploring new dimensions of household, women in Work Space and Public Spaces, gender and religious leadership, gender in digital space. **11 Hours**

**Tutorials**

Tutorials will focus on training students for conducting fieldwork exercise on any gender based social issue and prepare a brief report. The students will be taught to Review an ethnography/ monograph based on gender.

The students will be encouraged to make an annotated bibliography on any selected theme within the domain of gender and sexuality.

### **Core readings**

1. Aneja, Anu (2019) Women's and Gender Studies in India: Crossings. Routledge
2. Channa, Subhadra Mitra. (2013). Gender in South Asia: Social Imagination and Constructed Realities. Cambridge University Press.
3. de Beauvoir, Simone (2015). The Second Sex. Vintage Classics. Chicago.
4. Dube, Leela (Ed.), (2001). Anthropological explorations in gender: Intersecting Fields. New Delhi: Sage Publications.
5. Ortner, Sherry B. (1996). Making Gender: The Politics and Erotics of Culture. Boston: Beacon

### **Additional Readings**

1. Mascia-Lees E. Frances, Nancy Johnson Black (2017) Gender and the Body. Illinois. Waveland press.
2. Mehrotra, Nilika (2013). Disability, Gender and State Policy: Exploring Margins. Jaipur: Rawat Publications.

### **Assessment Methods**

Written assignment, practical examination and theory examination.

### **Teaching learning process**

Lectures, Active participation of students in class debates and discussions, sharing of experiences and dialogues. Innovative fieldwork exercises and workshops, short documentaries on gender issues.

**Keywords:** Gender, gender identity and gender expression, Feminism, South Asia, gender identity, gender narratives, gender performances, Gender discrimination, gender rights and gender justice.

### Semester-III

#### DISCIPLINE SPECIFIC ELECTIVES (DSE-9) Linguistic Anthropology

| Course Title and Code   | Total Credits | Credit distribution of the course |           |
|-------------------------|---------------|-----------------------------------|-----------|
|                         |               | Lecture                           | Practical |
| Linguistic Anthropology | 04            | 03                                | 01        |

#### Course Objectives

1. To understand the significance of language and culture in the history of humanity
2. To understand the relationship between language and communication

#### Learning Outcomes

- The students will be able to know how the use of language is important for communication
- Facilitate an understanding about the social context of language and its significance in socialization process.

#### Syllabus

##### Unit I: Meaning and Scope

Meaning, Nature and Scope of Linguistic Anthropology. Relation with other branches. Socio-cultural dimensions of language. Evolution of language and symbolic communication. Verbal and non-verbal communication by early huminids. characteristics of language. Tribal languages, endangered languages, and revitalization. Linguistic relativism

**12 Hours**

##### Unit II: Social Context of Language Use

Process of language acquisition and socialization. Structural linguistics: Lingua franca, parole, language and culture relationship, Edward Sapir-Whorf hypothesis, language, and social roles

**10 Hours**

##### Unit III: Structure of Linguistic Forms

Phonemes and phonology, morphemes and morphology, syntax and semantics, lexical relationships: Synonymy, antonymy, homonymy, homonymy.

**11**

**Hours**

##### Unit IV: Sanskrit as Ancient Indian Language

Linguistic affinities of Sanskrit (Indo-European/Indo-Aryan), Indian Culture and Heritage depicted through Sanskrit; Pre-Sanskrit languages: Prakrit (Indus Valley Civilization 2300-2500BC); Panini's Ashtadhyayi (7<sup>th</sup> and 8<sup>th</sup> Century); Brahmi Script (9<sup>th</sup> and 10<sup>th</sup> Century); Sanskrit Grammar and its scientificity.

**12 Hours**

**Keywords: language, culture, communication, socialization, structural linguistics**

**Practical**

**30 Hours**

1. Students use of specialized equipments/ softwares for understanding the language diversity and enhancing acquisition of MTB-MLE (Mother Tongue Based - Multilingual Education).
2. Use of Artificial Intelligence (AI) in documentation of endangering languages as a part of New Education Policy (NEP 2020).
3. Based on practical experiences, students are required to prepare and present the group-based project and discussion.

### **Core Readings**

1. Duranti, A. 1997. Linguistic Anthropology. Cambridge: Cambridge University
2. Misra. K. K. .2000. Text Book of Anthropological Linguistics. New Delhi: Concept Pub.
3. Verma, M.K. 1998. Socio–linguistics, Language and Society. New Delhi: Sage Publications.
4. Hymes, D. 1974. Foundations in Sociolinguistics: An Ethnographic Approach. Philadelphia:

### **Suggested Readings**

1. Chomsky, N. 1986. Knowledge of Language. New York: Praeger.
2. Krishna, S. 1991. India's Living Languages. New Delhi: Allied Publishers.
3. Laura. M. A. 2012. Living Language: An Introduction to Linguistic Anthropology. Oxford: Wiley-Blackwell.

### Semester-III

#### DISCIPLINE SPECIFIC ELECTIVES (DSE-10)

##### Economic Anthropology

| Course Title          | Total Credit | Credit distribution |           |
|-----------------------|--------------|---------------------|-----------|
| Economic Anthropology | 04           | Theory              | Practical |
|                       |              | 03                  | 01        |

#### Introduction

Economic Anthropology examines the production, distribution, exchange, and consumption of goods and services across cultures, emphasizing the embeddedness of economic processes in social, cultural, political, and ecological contexts. It contrasts with mainstream economics by prioritizing ethnographic methods, cross-cultural comparison, and holistic analysis over universal models of rational choice.

#### Course Objectives

- Introduce key concepts, theories, and methods in Economic Anthropology.
- Analyze diverse economic systems (subsistence, reciprocal, redistributive, market) through ethnographic case studies.
- Examine the interplay between economy, culture, power, gender, and environment.
- Critically evaluate the impacts of capitalism, globalization, and development on local communities, with special reference to India.

#### Learning Outcomes

By the end of the course, students will be able to:

- Differentiate Economic Anthropology from neoclassical economics and apply anthropological perspectives to economic phenomena.
- Critically discuss major theoretical debates and their relevance to contemporary issues.
- Interpret ethnographic data on production, exchange, consumption, and inequality.
- Reflect on ethical and applied dimensions of economic anthropology in development, sustainability, and policy contexts in India and globally.

#### Syllabus (theory)

##### Unit I: Foundations and Theoretical Perspectives

**12 Hours**

Emergence of Economic Anthropology; its relationship with Economics, Sociology, and other subfields; Formalist vs. Substantivist debate. Culturalist and Marxist/political economy approaches. Reciprocity (generalized, balanced, negative), redistribution, exchange, value, property, and moral economy. Case Studies: Gift economies, Kula, Potlatch.

**Unit II: Production, Livelihoods, and Modes of Economy****10 Hours**

Subsistence strategies: Foraging/hunter-gatherers (“original affluent society”), pastoralism, shifting and settled cultivation, peasant economies; Property regimes: Commons, land tenure, alienation; ecological and technological dimensions. Case studies from India (tribal economies, Jajmani system and Agrarian transformations).

**Unit III: Exchange, Consumption, and Markets****12 Hours**

Systems of exchange: Barter, money, markets; formal and informal economies, Consumption, commodities, and material culture; status, identity, and display. Financialization, debt, remittances, Modernization and neoliberal models. Market and the moral economy of Peasants. Gendered labor, Digital India and the Gig Economy

**Unit IV: Contemporary Issues, Development, and Applied Economic Anthropology****11 Hours**

Economic anthropology of development, poverty, and inequality; Critiques of Impacts on indigenous/tribal communities. The Social Life of Infrastructure; Economic processes Economic Justice and Sustainability issues.

**Practical (1 Credit)****30 Hours**

**Field-based Ethnographic Research on Economic Practices** (approx. 30-45 hours, including fieldwork).

Objectives: Apply concepts through hands-on research; develop skills in observation, interviewing, and analysis.

Activities:

Students (individually or in small groups) will conduct a short ethnographic study (e.g., 5-7 days of fieldwork) on a local economic topic, such as a market, informal economy, household livelihood strategies, craft production, or urban vending in Delhi/NCR or a nearby area

Outputs: Field notes, a short report (1500-2000 words) or presentation analyzing findings in relation to course concepts, plus reflexive notes on ethics and challenges

**CORE READINGS**

1. **Aneesh, A. (2015).** *Neutral Accent: A Case Study of Globalized India*. Princeton University Press.
2. **Appadurai, A. (1986).** "Introduction: Commodities and the Politics of Value." In *The Social Life of Things*.
3. **Breman, J. (2019).** *Capitalism, Inequality and Labour in India*. Cambridge University Press.
4. **Carrier, J. G. (Ed.). (2020).** *A Handbook of Economic Anthropology* (3rd ed.). Edward Elgar Publishing
5. **Damodaran, H. (2018).** *India's New Capitalists: Caste, Business, and Industry in a Modern Nation*. Hachette India.
6. **Harriss-White, B. (2020).** *India Working: Essays on Society and Economy*. Cambridge University Press.
7. **Mauss, M. (2016).** *The Gift: Expanded Edition*. Hau Books
8. **NITI Aayog (2025/2026).** *Latest Reports on Digital Transformation and Rural Livelihoods*
9. **Parnaik S. M. (1996).** *Displacement, Rehabilitation and Social Change: The Case of Paraja Highlanders*. New Delhi: Inter-India
10. **Polanyi, K. (2001 [1944]).** *The Great Transformation: The Political and Economic Origins of Our Time*. Beacon Press.

11. **Hann, C., & Hart, K. (2011).** *Economic Anthropology: History, Ethnography, Critique.* Polity Press.

### Semester-III

#### DISCIPLINE SPECIFIC ELECTIVES (DSE-11)

##### Political Anthropology

| Course Title and Code  | Total Credits | Credit Distribution of the Course |           |
|------------------------|---------------|-----------------------------------|-----------|
|                        |               | Lecture                           | Practical |
| Political Anthropology | 04            | 03                                | 01        |

##### Course Objectives

1. To understand key concepts such as power, authority, legitimacy, and governance.
2. To examine state and stateless political formations.
3. To analyse political processes, including identity, representation, participation, and resistance.
4. To understand customary law and legal pluralism in contexts of state and nation.

##### Learning Outcomes

By the end of the course, students will be able to:

1. Understand the evolution and contemporary relevance of political processes and political systems using anthropological frameworks.
2. Understand the role of power, authority and governance in different cultural settings.

##### Syllabus (theory)

**Unit-I:** Political Anthropology: Concepts and Approaches, Emergence of Political Anthropology Concepts: power, authority, agency, legitimacy, Governmentality. Stateless societies and segmentary lineage systems.

**12**

**Hours**

**Unit-II:** Political Institutions: Structure and Process, Variation in Types of Political Organisation, Diverse Roles of Political Institutions in Small-Scale Communities. Bureaucracy and Governance, Anthropology of the State. Concept of customary law: norms, sanctions, and social control and Interface with state law. Kinship and Politics, Dispute Resolution.

**12 Hours**

**Unit-III:** Local Governance, Panchayati Raj Institutions (PRIs), Urban local bodies. Village councils, tribal governance systems, and kinship networks. Tribal movements.

**11 Hours**

**Unit-IV:** Gender, caste, and marginality, state, and democracy. Issues of representation and identity. Caste Politics, Ethnic movements. Digital governance and its implications.

**10 Hours**

**Keywords:** Political Anthropology, Anthropology of State, Customary Law and Legal Pluralism, Representation, Identity.

**Practical**

**30 Hours**

1. Design a field-based ethnographic research proposal on any of the following:

Functioning of local governance bodies (Panchayat / Municipality), Role of customary law in dispute resolution, Political participation at the community level, Bureaucratic processes (ration office, local administration, etc.), Implementation of a government scheme, Role of NGOs in governance, Women in governance.

2. Submission of Case Study Report of any contemporary concerns, political literature, reports, magazines, journals, etc., using anthropological concepts (power, governance, customary law, governmentality, etc.).
3. Oral presentation of a research project based on fieldwork, theoretical linkage, and discussion.

### **Suggested Readings**

1. Bailey, F. G. (1963). *Politics and Social Change*. Berkeley: University of California Press.
2. Balandier, G. (1970). *Political anthropology* (A. M. Sheridan Smith, Trans.). Allen Lane The Penguin Press. (Original work published 1967)
3. Evans-Pritchard, E. E. (1940). *The Nuer: A description of the modes of livelihood and political institutions of a Nilotic people*. Oxford University Press.
4. Fortes, M., & Evans-Pritchard, E. E. (Eds.). (1940). *African political systems*. Oxford University Press.
5. Foucault, M. (1991). Governmentality. In G. Burchell, C. Gordon, & P. Miller (Eds.), *The Foucault effect: Studies in governmentality* (pp. 87–104). University of Chicago Press.
6. Kurtz, D. V. (2001). *Political anthropology: Power and paradigms*. Westview Press.

7. Weber, M. (1978). *Economy and society* (G. Roth & C. Wittich, Eds.). University of California Press.

**Semester-III**  
**DISCIPLINE SPECIFIC ELECTIVES (DSE-12)**

**Anthropology of Development**

| Course Title and Code              | Total Credits | Credit distribution of the course |           |
|------------------------------------|---------------|-----------------------------------|-----------|
|                                    |               | Lecture                           | Practical |
| <b>Anthropology of Development</b> | <b>04</b>     | <b>03</b>                         | <b>01</b> |

**Course Objectives**

1. To understand the term Development, evolution of the concept and theoretical paradigm.
2. To study the engagement by different stakeholders at various development activities
3. To understand ethical issues and evaluation of development project, community participation, livelihood and empowerment

**Learning Outcomes**

- The students will be able to understand the concept and approaches in anthropology of development.
- The students will be able to know the realities of developmental issues at grassroots level.
- Examine the role of anthropologist and other agencies in development process.

**Syllabus (theory)**

Unit I: Meaning and Scope: understanding development: Theory and Practice classical foundations and debates. **10 Hours**

Unit II: Approaches in the Anthropology of Development **8 Hours**

Unit III: Anthropology and Development Interfaces, Globalization, Sustainable Development, Constitutional Provision, Gender and Development, Indigenous Knowledge and Development, Issues of Displacement, Development and conservation debate/ Development projects and social logic. **13 Hours**

Unit IV: Role of Anthropology in Development, Community Development, Agencies for Development Issues and challenges for Development, Social Impact Assessment, RRA/PRA **14 Hours**

**Keywords: Policy, Development, Community, Evaluation, Agencies, PRA**

**Practical 30 Hours**

1. Prepare a project based on any contemporary issues relating to development project in India by employing various sources viz. books, journals, magazines, government reports newspaper articles, etc.
2. Provide a comprehensive bibliography.

### 3. Presentation of the project and group discussion

#### Core Readings

1. Cochrane, Glynn. 1971. *Development Anthropology*. OUP
2. Edelman, Marc & Angelique Haugerud (eds) 2005. *The anthropology of development and globalisation: From classical political economy to contemporary neoliberalism*. Oxford: Blackwell.
3. Gardener, K. & D. Lewis 2015. *Anthropology and Development: Challenges for the twenty-first century*. London: Pluto
4. Escobar, Arturo. 1995. *Encountering Development: The Making and Unmaking of the Third World*, Princeton, N. J. Princeton University Press.
5. Harrison, E. & Crewe, E. 1999. *Whose development? An ethnography of aid*. London: Zed Books
6. Mathur, Hari Mohan (ed). 1977. *Anthropology in Development Process*. New Delhi. Vikas Publishing House

#### Suggested Readings

1. Berreman, Gerald D. 1994. *Anthropology, Development and Public Policy. Occasional*
2. *Papers in Sociology and Anthropology* Vol.4, pp.3-32.  
<https://www.nepjol.info/index.php/OPSA/article/view/1083>
3. Chambers, Robert, 2013. *Rural Development: Putting the Last First*, London: Longman (1983).
4. Mosse, David, and David Lewis. 2005. *The Aid Effect: Giving and Governing in International Development*. Pluto Press
5. Olivier de Sardan, Jean-Pierre. 2005. *Anthropology and Development: understanding social change*. London: Zed Press.
6. Mair, Lucy. 1984. *Anthropology and Development*. London: Macmillan

**Semester-III**  
**Generic Elective GE-3**  
**Indian Prehistory**

| Course Title and Code | Total Credits | Credit Distribution of the Course |           |
|-----------------------|---------------|-----------------------------------|-----------|
|                       |               | Lecture                           | Practical |
| Indian Prehistory     | 04            | 03                                | 01        |

### Course Objectives

To critically explore the prehistoric roots of the Indian subcontinent through its geological context, key archaeological sites, and evolving cultural patterns, from early foragers to complex societies.

### Learning Outcomes

By the end of the course, students will be able to:

- Analyze the geological and environmental backdrop of Indian prehistory.
- Evaluate key theoretical frameworks in archaeology and their relevance to Indian contexts.
- Understand the transition from foraging to farming and the formation of complex settlements.
- To understand the legacy of early Indian civilizations through material and cultural aspects.

### Course Content

#### Unit I: Geological, Environmental, and Theoretical Perspectives.

**12 Hours**

- Overview of major geological formations in India.
- Stratigraphy of the Indian subcontinent: implications for cultural chronology.
- Middle-Range Theory and Processual Archaeology: science and systems thinking.
- Post-Processual and Postmodern Archaeology: agency, symbols, and subjectivity.

#### Unit II: Early Human Adaptations – Palaeolithic Cultures in India.

**11 Hours**

- Indian Palaeolithic Cultures: Regional Patterns and Material Culture. Sites across Northern, Western, Central, Eastern, and Southern India.
- Tool typologies, raw materials, and cognitive evolution.

#### Unit III: Transitional Cultures – The Mesolithic and Beginnings of Agriculture.

**12 Hours**

- The Indian Mesolithic: Transition and Transformation.
- Microlithic technology and subsistence diversification across regions.
- The Agricultural Revolution and Early Village Cultures.

#### Unit IV: Emergence of Early Civilisation.

**10 Hours**

- Emergence of urban centers and state systems.
- The Harappan Civilisation: urban planning, trade, symbolism, and statecraft.
- Comparative perspectives: Harappa and other contemporary civilisations.

### Practical/ Project

**30 Hours**

1. Identification of stone tools-type, technology and function
2. Identification of ceramic traditions- type, technology and function

3. Computer applications for archaeology
4. Geographical Information System (GIS) for archaeology

### Core Readings

1. Allchin, B., and Allchin, R. (1997). *Origins of a civilization: The prehistory and early archaeology of South Asia*. New Delhi: Viking.
2. Chakravarty, K. K., and R. G. Bednarik. (1997). *Indian Rock Art in Global Context*. Delhi: Motilas Banarasidass & IGRMS.
3. Bhattacharya, D.K. (2006). *An outline of Indian Prehistory*. Delhi: Palaka Prakashan.
4. De Terra, H. and T.T. Paterson, ( 1939). *Studies on the Ice Age in India and Associated Human Cultures*. Washington: Carnegie Institution of Washington Publication No.493.
5. Sankalia, H.D. (1974). *The Prehistory and Protohistory of India and Pakistan*. Pune: Deccan College Postgraduate and Research Institute.
6. Shinde, V. (Ed.). (2015). *Harappan archaeology: Early sites in Western India*. Oxford University Press.
7. Wheeler, M. (1968). *The Indus Civilization* (Vol. 1). Cambridge University Press Archive.

### Suggested Readings

1. Clark, J.D. and Sharma, G.R. (Eds.) *Palaeoenvironment and Prehistory in the Middle Son Valley, Madhya Pradesh, North Central India*. Allahabad: Abinash Prakashan.
2. Dhavalikar, M.K. (Ed.). (2013). *Prehistory of India*. New Delhi: Manohar Publishing.
3. Fagan B. M. (2004). *People of the Earth: An Introduction to World Prehistory*. New Jersey: Pearson Education.
4. H. and R.F. Heizer. (1969). *An Introduction to Prehistoric Archaeology*. New York: Hold, Rinehart and Winston, INC. Hole,
5. Lee, R.B and I. Devore (Eds.) (1977). *Man the Hunter*. Chicago: Aldine Publishing Company.

**Semester-III**  
**Generic Elective GE-4**  
**Anthropology of Northeast India**

| Course Title and Code                  | Total Credits | Credit distribution of the course |           |
|----------------------------------------|---------------|-----------------------------------|-----------|
|                                        |               | Lecture                           | Tutorial  |
| <b>Anthropology of Northeast India</b> | <b>04</b>     | <b>03</b>                         | <b>01</b> |

**Course Objectives:**

1. To introduce students to the historical, political, and demographic context of Northeast India, with an emphasis on colonial and post-independence transformations.
2. To critically examine development policies and governance frameworks affecting the region.
3. To explore the cultural richness of Northeast India through its arts, music, festivals, and ethnographic literature, enabling a nuanced understanding of identity, tradition, and sustainability.

**Learning Outcomes**

1. Students will be able to critically analyse the socio-political history and identity politics of Northeast India in both colonial and post-colonial contexts.
2. Develop the ability to assess the impact of development and policies on the region's environment, economy, and people.
3. Demonstrate an understanding of the region's cultural diversity and ethnographic narratives through engagement with case studies and various forms of writing.

**Syllabus**

**Unit I Situating Northeast India**

**12 Hours**

History and demography, Colonial intervention, Post-independence conflicts, Traditional Institutions, Political and Economic Transformation, Identity Politics

**Unit II Development, Governance, and Policy**

**12 Hours**

Development approach, Biodiversity Conservation, Tourism, Constitutional Safeguards, Look East Policy

**Unit III Cultural Heritage**

**11 Hours**

Arts and Aesthetics, Architecture, Music, Festivals, Case Studies on Sustainability

**Unit IV Ethnographies on Northeast**

**10 Hours**

Classical British Ethnography, Contemporary Ethnography, Ethnofiction, Autoethnography

**Tutorial:** The students shall be required to discuss and write tutorial assignments around certain important topics of contemporary relevance.

### Core Readings

1. Ao, Temsula. 2005. *These Hills Called Home*. Penguin
2. Bhagat Oinam, Dhiren A. Sadokpam. (eds) 2018. *Northeast India: A Reader*. Taylor & Francis.
3. Hazarika, Sanjoy. 2000. *The Strangers of the Mist: Tales of War and Peace from India's Northeast*. India Penguin
4. Nongbri, Tiplut (ed) 2021. *Materiality and Visuality in North East India: An Interdisciplinary Perspective*. Springer
5. Pachau, Joy. 2014. *Being Mizo: Identity and Belonging in Northeast India*. New Delhi: Oxford University Press

### Suggested Readings

1. Patnaik, SM. 2014. 'Consuming Culture: The Refiguration of Aesthetics in Nagaland Cultural Tourism in India's North East' In Kaur, R., & Dave-Mukherji, P. (Eds.). *Arts and Aesthetics in a Globalizing World* (1st ed.). Routledge.

**Semester-IV**  
**DSC-9**  
**Paleoanthropology**

| Course Title and Code        | Total Credits | Lecture | Practical | Tutorial | Eligibility                              |
|------------------------------|---------------|---------|-----------|----------|------------------------------------------|
| Paleoanthropology<br>(DSC-9) | 04            | 03      | 01        | 00       | UG in<br>Anthropology /<br>Life Sciences |

### **COURSE OBJECTIVES**

To give students a thorough and up-to-date understanding of the hominin fossil record, from the earliest African ancestors to modern humans.

To introduce students to the key methods used in paleoanthropology, including geochronological applications, comparative anatomy, stone tool analysis, and the growing role of ancient DNA and stable isotope studies.

To examine the Indian and South Asian fossil and archaeological record in its own right and in relation to broader patterns of hominin evolution and dispersals.

To encourage awareness of the ethical responsibilities involved in studying human remains and working with communities whose cultural heritage is connected to paleoanthropological sites.

### **LEARNING OUTCOMES**

By the end of this course, students will be able to:

1. Describe and compare the major hominin species in the fossil record, explaining their key physical features and geographical range.
2. Explain the main methods used to date paleoanthropological sites and reconstruct past environments.
3. Critically read and discuss research articles from paleoanthropology journals, identifying the evidence, the argument being made, and the alternative interpretations.
4. Describe the key fossil and archaeological sites in India and South Asia within the wider context of human evolution.
5. Carry out basic practical tasks, including fossil cast identification, skeletal measurement, lithic description, and structured field observation, and report on findings in a clear and organised manner.

### **COURSE CONTENT**

#### **Unit I: Understanding Human Evolution: Background and Methods**

15 Hours

History and debates in paleoanthropology. Methods, dating, taphonomy, environments, and analytical tools of paleoanthropology; Evolving scientific debates, fossil interpretation, and technological advances. Lomekwian culture, early hominins, bipedalism, anatomy, diet, ecology,

key fossils, evolutionary relationships, and debates on the origins of the genus *Homo* across Africa.

**Unit II: The Genus *Homo*: From Early *Homo* to Archaic Humans**

12 Hours

Evolution of *Homo*, early species, tools, dispersal, diversity, scavenging vs hunting debate, island hominins, Oldowan, Acheulean, Middle Palaeolithic, Middle Pleistocene populations, and genetic evidence shaping global understanding of human ancestry.

**Unit III: India and South Asia in the Story of Human Evolution**

12 Hours

South Asian paleoanthropology, Siwalik fossils, Narmada hominin, archaeology, Acheulean sites, microliths, dispersals, genetics, and the history of research in human evolution studies, decolonising paleoanthropology.

**Unit IV: Neanderthals, Modern Human Origins, and the Peopling of the World**

6 Hours

Neanderthals, Upper Palaeolithic, Denisovans, modern human origins, interbreeding, dispersals, fossils, genetics, symbolic behaviour (includes prehistoric ornaments, use of ochre mineral, rock art, etc.), evolutionary models, and the global spread of *Homo sapiens* overview.

**PRACTICAL  
Hours**

**30**

1. Primate and Hominin Osteology: Students identify, label, and compare cranial and post-cranial skeletal elements of non-human primates and humans using casts and reference specimens. Key measurements are recorded, and differences between ape and human skeletons are discussed in terms of their functional and evolutionary significance.
2. Fossil Identification and Description: Students work with a set of fossil hominins representing key species across the hominin lineage, from *Australopithecus afarensis* through to early modern *Homo sapiens*. For each specimen, they record the site and date of discovery, describe the main anatomical features, note what is significant about the specimen, and place it within the overall picture of human evolution. Special attention is given to *Homo erectus* and its comparison with other archaic *Homo* specimens.
3. Stone Tool Identification and tool knapping: Students examine replica stone tools or published photographs representing the main technological traditions in the paleoanthropological record: Oldowan, Acheulean, Lomekwian, Middle Palaeolithic, Upper Palaeolithic and Mesolithic. They practise identifying tool types, describing their basic features, and associating each tradition with the hominin species and time periods involved. A comparative table and a brief written summary are submitted. Replicating stone tools through experimental flintknapping.
4. Field Excursion and Report: A visit to a relevant palaeontological or archaeological site or museum collection, such as the Delhi Ridge, JNU campus, Geological Survey of India Museum, a Siwalik exposure, or a regional site of significance, for structured observation, documentation, and discussion. Students submit a field report of no more than 1,500 words that covers the site context, what was observed, and a critical reflection on the site's place in Indian and global paleoanthropology.

### Core Readings

1. Klein, R. G. (2009). *The Human Career: Human Biological and Cultural Origins* (3rd ed.). University of Chicago Press.
2. Stringer, C., & Andrews, P. (2011). *The Complete World of Human Evolution* (2nd ed.). Thames & Hudson.
3. Wood, B. (2005). *Human Evolution: A Very Short Introduction*. Oxford University Press.
4. Tattersall, I. (2015). *The Strange Case of the Rickety Cossack, and Other Cautionary Tales from Human Evolution*. Palgrave Macmillan.
5. Reich, D. (2018). *Who We Are and How We Got Here: Ancient DNA and the New Science of the Human Past*. Oxford University Press.
6. Fleagle, J. G., Baden, A. L., & Gilbert, C. C. (2024). *Primate adaptation and evolution*. Academic Press.

### Suggested Research Articles

1. Hublin, J.-J., et al. (2017). New fossils from Jebel Irhoud, Morocco and the pan-African origin of *Homo sapiens*. *Nature*, 546, 289–292.
2. Prufer, K., et al. (2014). The complete genome sequence of a Neanderthal from the Altai Mountains. *Nature*, 505, 43–49.
3. Berger, L. R., et al. (2010). *Australopithecus sediba*: A new species of Homo-like Australopithecine from South Africa. *Science*, 328, 195–204.
4. Lordkipanidze, D., et al. (2013). A complete skull from Dmanisi, Georgia, and the evolutionary biology of early *Homo*. *Science*, 342, 326–331.
5. Morwood, M. J., et al. (2004). Archaeology and age of a new hominin from Flores in eastern Indonesia. *Nature*, 431, 1087–1091.
6. Patnaik, R. (2016). Indian Neogene Siwalik mammalian biostratigraphy: An overview. *Vertebrate Paleobiology and Paleoanthropology Series*, 423–444.
7. Bhandari, A., Kay, R. F., Williams, B. A., Tiwari, B. N., Bajpai, S., & Hieronymus, T. (2018). First record of the Miocene hominoid *Sivapithecus* from Kutch, Gujarat state, western India. *PLoS One*, 13(11), e0206314.
8. Pappu, S., et al. (2011). Early Pleistocene presence of Acheulian hominins in South India. *Science*, 331, 1596–1599.

### ASSESSMENT METHODS

Theory Examination and Continuous Assessment through practicals, field data report and seminar participation.

### KEYWORDS

Paleoanthropology, Human Evolution, Fossil Record, Australopithecines, *Homo erectus*, Neanderthals, Ancient DNA, Bipedalism, Stone Tools, Taphonomy, Dating Methods, Out of Africa, Siwalik Hominoids, Narmada Fossil, Indian Paleoanthropology, Middle Stone Age, Modern Human Origins, Archaic *Homo*, South Asian Prehistory, Hominin Dispersals, pre-Australopithecines, Levant, Europe, Asia, Australia.



**Semester-IV****DSC-10****Tribal India**

| Course Title and Code | Total Credits | Credit Distribution of the Course |           |
|-----------------------|---------------|-----------------------------------|-----------|
|                       |               | Lecture                           | Practical |
| <b>Tribal India</b>   | <b>04</b>     | <b>03</b>                         | <b>01</b> |

**Course Objectives**

1. To understand the anthropological concept of tribe and its relevance in the Indian context.
2. To examine the structures and functions of tribal social institutions and analyse dynamics of continuity, change & adaptation.
3. To analyse contemporary challenges tribal communities face and the role of development policies and legal frameworks in addressing tribal issues.

**Learning Outcomes**

1. Students will be able to assess the evolution and application of the concept of tribe in India, including debates around indigeneity.
2. Demonstrate understanding of tribal social systems and cultural practices, and articulate the ways in which these have been maintained or transformed in response to socio-economic and political pressures.
3. Evaluate tribal development strategies and policy frameworks and analyse their effectiveness in addressing displacement, marginalisation, and rights-based issues.

**Syllabus (theory)****Unit I Concepts and Classification****10 Hours**

Evolution of the concept of tribe in Indian context; Anthropological approaches to the study of tribe; the idea of indigenous people; geographic and linguistic distribution of tribes in India; Particularly Vulnerable Tribal Groups, Denotified Communities

**Unit II Tribal social structure and institution: change and continuity****11 Hours**

Kinship, family and marriage; traditional governance, customary law; livelihood and occupational pattern; religious faiths, beliefs and practices; tribal arts and aesthetics: Gender in tribal societies, youth dormitories; Age-grade systems; political organisation, Traditional ecological knowledge, Tribal health and Nutrition.

**Unit III Contemporary tribal issues and challenges****12 Hours**

Impact of Industrialization, urbanization and globalization; Politics of identity and ethnicity; socio-economic issues- land alienation, poverty, healthcare and education; social mobility; representation in Indian political system, participation in governance

**Unit IV Tribal development and policies:****12 Hours**

Approaches to tribal development: community-based approaches and participatory development. Plans and policies: National Tribal Policy, Forest Rights Act, affirmative action; tribal displacement and rehabilitation in India; PESA Act 1996, Role of NGOs & Civil Society.

**Practical****30 Hours**

1. Map out the various tribal communities on a map of India: migration pattern, kinship system, marriage practices, occupation, social unrest and conflict, religious beliefs and practices etc. The proposed exercise has to be executed based on intensive readings of tribal monographs available in the department library.
2. Write a book review of any tribal ethnography. The review has to be presented and discussed in the classroom.
3. Make a visual presentation digital poster on one tribe of your choice or as suggested by the course teacher. Focus on gender roles, sustainability, and cultural heritage.
4. Write a project report of not more than 3000 words on contemporary tribal issues in India.

**Core Readings**

1. Fürer-Haimendorf, Christoph von. 1982. *Tribes of India: The Struggle for Survival*. Delhi: Oxford University Press.
2. Srivastava, V. K. 2008. Concept of 'Tribe' in the Draft National Tribal Policy. *Economic and Political Weekly*, Vol. 43, No. 50 pp. 29-35
3. Vidyarthi, L.P. 1977. *Tribal Culture of India*: Concept Publishing company. New Delhi
4. Xaxa, Virginius. 2008. *State, society, and tribes: issues in post-colonial India*. New Delhi: Dorling Kindersley.

**Suggested Readings**

1. Radhakrishna, M. (2007). Urban Denotified Tribes: Competing Identities, Contested Citizenship. *Economic and Political Weekly*, 42(51), 59–64.
2. Nongbri, T. (2001). Democracy, Gender and Tribes : A Critical Appraisal of India's Constitutional Policies. *Indian Anthropologist*, 31(2), 1–14.

3. Patnaik, S. M. 1993 Patriarchy among the Parajas: Innocuous Tradition or Invisible Violence? *Indian Anthropologist* Vol.23 No 1 PP 65-71
4. Zhimo, A. G. (2019). Indigenous System of Governance and its Implication: The case of Nagaland. *Indian Anthropologist*, 49(2), 41–56.

**Semester-IV****DSE-14****Anthropology of Public Policy**

| Course Title and Code         | Total Credits | Credit Distribution of the Course |           |
|-------------------------------|---------------|-----------------------------------|-----------|
|                               |               | Lecture                           | Practical |
| Anthropology of Public Policy | 04            | 03                                | 01        |

**Course Objectives**

1. To examine the roles and nature of engagement by different stakeholders at various institutions.
2. To analyze the relationship between public policy, culture, community development and social justice.
3. To understand about the importance of public policy in safeguarding society, environment, etc.

**Learning Outcomes**

By the end of the course, students should be able to:

1. Understand the concept and approaches of anthropology of Public Policy, commitment of anthropologist in policy research and policy formulation, etc.
2. Know the significance of public policy in maintaining the well-being of the society
3. Examine the contemporary program and policies in India.
4. Apply anthropological methods in policy-research & evolution.

**Syllabus (theory)**

**Unit-I:** Anthropology of Public Policy. Meaning scope and Approaches. Emergence of Anthropology of Public Policy emergence of Anthropology and Public Policy: Interface, Applied Anthropology.

**12 Hours**

**Unit-II:** Relevance of Anthropologists in Public Policy and Administration: Contextualising Anthropological Knowledge: Power, Representation, and Public Policy, Debates.

**12 Hours**

**Unit-III:** Development Discourse and Community participation sustainable development goals, Development Agencies and local dynamics. Case studies of welfare, environment, health, and local governance.

**11 Hours**

**Unit-IV:** Methodological and Ethical concerns in Anthropology of Policy Research. Media and Public Policy. Implementation monitoring and Evaluation. Policy Appraisal, Social Impact Assessment (SIA).

**10 Hours**

**Keywords:** Policy, Development, Community, Evaluation, Agencies, Appraisal

**Practical****30 Hours**

1. Prepare a project based on any contemporary issues related to public policy and governance in India by employing various sources viz. books, journals, magazines, government reports newspaper articles, etc.
2. Presentation of the project and group discussion.
3. Policy Brief (1500 words)
4. Evolution of one \_SDG relate programme.

**Core****Readings**

1. Belshaw, C. S. (Ed.). (2014). *The sorcerer's apprentice: An anthropology of public policy* (Vol. 4). Elsevier.
2. Geilhufe, N. L. (1979). Anthropology and policy analysis. *Current Anthropology*, 20(3), 577-579.
3. Patnaik, S. M. (2016). Whither anthropology in public policy?: Reflections from India. In S. Coleman, S. B. Hyatt, & Kingsolver (Eds.), *The Routledge Companion to Contemporary Anthropology* (1<sup>st</sup> ed.) (pp. 416-432). Routledge
4. Shore, C. (2012). Anthropology and Public Policy. In R. Fardon, O. Harris, T. H. J. Marchand, M. Nuttall, C. Shore, V. Strang, & R. A. Wilson (Eds.), *The SAGE handbook of social anthropology* (Vol. 2, pp. 89–104). SAGE.
5. Shore, C., & Wright, S. (Eds.). (2003). *Anthropology of policy: Perspectives on governance and power*. Routledge.

**Suggested Readings**

1. Cairney, P. (2019). *Understanding Public Policy: Theories and Issues*. United Kingdom: Bloomsbury Publishing.
2. Fiske, S. J. (2006). Anthropology in pursuit of public policy and practical knowledge. *NAPA Bulletin*, 26(1), 82-107.
3. Head, B. W. (2022). *Wicked Problems in Public Policy: Understanding and Responding to Complex Challenges*. Switzerland: Springer International Publishing.
4. Wedel, J.R. & Feldman, G. (2005), Why an anthropology of public policy? *Anthropology Today*, 21(1), 1-2.
5. Van Willigen, J. (2002). *Applied anthropology: An Introduction*. Greenwood Publishing Group.

**Teaching Learning Process**

Classroom teachings  
Seminars, presentations and group discussion  
Practical classes

**Assessment Methods:**

Assignment, Theory and practical examinations (including practical records)

**Semester-IV****DSE-15****KINANTHROPOLOGY**

| Course Title and Code  | Total Credits | Credit Distribution of the Course |           |
|------------------------|---------------|-----------------------------------|-----------|
|                        |               | Lecture                           | Practical |
| <b>KINANTHROPOLOGY</b> | 04            | 03                                | 01        |

**Course Objectives:**

1. To introduce students to the applied knowledge of Biological Anthropology.
2. The course shows diverse and integrated nature of anthropological work and how the biological anthropological knowledge and methods can be applied for the human welfare.
3. The course equips in theoretical & applied aspect of Kinanthropology.

**Learning Outcomes:**

1. The students will be trained with tools and techniques of kinanthropology that can help understanding growth, exercise, performance and nutrition.
2. The students can develop holistic integrated approach that can help in the field of Physical Education, sport, recreation, rehabilitation and physiotherapy.
3. The student can be encouraged to come up with innovative idea of human welfare especially in sports, physical education, and education.

**Unit I: History, Concept, Scope, Applications and relationship with allied disciplines****(12****Hours)****Human movements: Concept and determinants**

1. Origin and evolution of Kinanthropology

2. Definition, Scope and relevance of Kinanthropology
3. Relationship with other allied disciplines
4. Recent advances and future perspectives in kinanthropological research
5. Applications of kinanthropology in health, sports, dance and forensic sciences

**Unit II: Tools & techniques in Kinanthropology. (12 Hours)**

1. Traditional & modern methods in Kinanthropology
2. Physical fitness assessment
3. Sports injuries and rehabilitations

**Unit III: Physical fitness and environmental stresses (11 Hours)**

1. Health and skill related components- Strength, endurance, flexibility, agility etc.
2. Effect of temperature extremes on the performance

**Unit IV: Importance in Sports, Recreation and Physical Education (10 Hours)**

1. Physical conditioning Training-Techniques and Physiological effects
2. Body composition, Nutrition, Doping and Performance
3. Sports talent identification.

**Practical (30 hours)**

1. Kinanthropometric measurements: Stature, height, weight arms span, body circumference, skinfold, BMI, Bone Breadth.
2. Physical fitness assessment tests: Handgrip strength, flexibility test, cardiovascular endurance assessment and balance assessment.
3. Comparison of anthropometric, profiles among athletes of different sports.
4. Preparation of individual fitness profile.
5. 1-2 workshops/ project over the academic semester on topics related to kinanthropology.

**Suggested readings:**

1. Singh, S.P., & Mehta, P. (2009). Human Body Measurements: concepts and application. PHI Learning Pvt. Ltd.
2. Physical activity and Growth by RJ Shephard, 1982 (Mosby).
3. Renson,R. (1989). From Physical Education to Kinanthropology: A Quest for Academic and Professional Identity. QUEST (41) 235-256
4. Human Body Composition by Heymsfield, Lohman, Wang and Going. 1996 (Human Kinetics).
5. Human Body Composition by Heymsfield, Lohman, Wang and Going. 1996 (Human Kinetics).

**Semester-IV**

**DSE-16**

**Psychological Anthropology**

| Course Title and Code             | Total Credits | Credit Distribution of the Course |           |
|-----------------------------------|---------------|-----------------------------------|-----------|
|                                   |               | Lecture                           | Practical |
| <b>Psychological Anthropology</b> | 04            | 03                                | 01        |

**Course Objectives**

- Introduce student's to the theories and perspectives of psychological anthropology and their significance within anthropological frameworks.

- Examine culturally specific understandings of mind, self, emotion, and behavior especially with reference to the Indian contexts.
- Foster a critical perspective on mental health and illness, status and characteristic of mental health among the tribes in India.
- Equip students with analytical tools that are culturally sensitive and pertinent to anthropology and related disciplines.

### **Learning Outcomes**

- Explain key concepts of Psychological anthropology and Indian psychology and their anthropological significance.
- Compare Indian and cross cultural perspectives of mind, self, and behavior.
- Analyze emotions, motivations, and rituals as culturally regulated psychological anthropological processes.
- Critically interpret mental health, illness, and healing practices in Indian contexts.
- Apply psychological anthropological perspectives to contemporary anthropological issues and research.

### **Syllabus (theory)**

#### **Unit 1: Emergence of Psychological Anthropology**

**10 Hours**

Historical development of psychological anthropology: Psychological anthropology and its relationship to Cultural Psychology, Social Psychology, Psychiatry and Transcultural Psychiatry. Recent advances

#### **Unit 2: Foundations of Human Behavior**

**10 Hours**

Major theories of human behavior including evolutionary, biological, psychological, and anthropological perspectives, along with key thinkers and their contributions, socialization and personality development across culture.

#### **Unit 3: Mind, Individual, Culture and Behavior**

**10 Hours**

Identity Emotion, Motivation, and Human behavior in Universal and Indian contexts Role of everyday religion, ritual symbolism, and emotional regulations. Renunciation from below in Indian society. Key concepts from Indian psychology and their psychological anthropological interpretation.

#### **Unit 4: Psychiatric Anthropology and Mental Health**

**15 Hours**

Introduction to psychiatric anthropology, mental health, Culture and Mental illness. Ethno-psychiatry and Mental Health among Tribes and Aranya communities. Anthropological dimensions of depression, schizophrenia, borderline personality disorder, anxiety disorders, and culture-bound syndromes. Recent advances in psychiatric anthropology.

### **Practical**

**30 Hours**

1. Qualitative and Quantitative Methods in Psychological anthropology
2. Fieldwork based Ethnographies on the following topics  
The students will formulate a research design and conduct a mini ethnography and submit their report on the following topics:
  - a. Religious or ritual space (temple, shrine, satsang, pilgrimage site)
  - b. Healing practice (Ayurveda clinic, yoga centre, faith healing context)
  - c. Everyday religious practices within family or community
  - d. On the concept of Self, emotion, suffering or well-being using Indian psychology
3. Psychological profiling using standard Psychological tests and their anthropological adaptation and Field testing
4. Ethical considerations in Psychological anthropological fieldwork.

### **Suggested Readings**

- Imgham, J. M. (1996). *Psychological Anthropology Reconsidered*. Cambridge: Cambridge University Press.
- Melford E. Spiro. *Culture and Human Nature*. University of Chicago Press.
- Schwartz, Theodore, Geoffrey M. White and Catherine A. Lutz, eds. (1992). *New Directions in Psychological Anthropology*. Cambridge: Cambridge University Press.
- Srivastava. V.K. (1997). *Religious Renunciation of a Pastoral People* (1997). OUP
- Shweder, Richard A. and Robert A. LeVine, eds. (1984). *Culture Theory: Essays on Mind, Self and Emotion*. Cambridge: Cambridge University.
- Strauss, Claudia and Naomi Quinn. (1997). *A Cognitive Theory of Cultural Meaning*. Cambridge: Cambridge University Press.
- Sudhir Kakar. (2001). *The Essential Writings of Sudhir Kakar*. Delhi: Oxford University Press.

**Semester-IV****DSE-17****Genetic Epidemiology****CREDIT DISTRIBUTION, ELIGIBILITY AND PRE-REQUISITES OF THE COURSE**

| Course Title and Code       | Credits   | Credit distribution of the course |                     |
|-----------------------------|-----------|-----------------------------------|---------------------|
|                             |           | Lecture                           | Practical/ Practice |
| <b>Genetic Epidemiology</b> | <b>04</b> | <b>03</b>                         | <b>01</b>           |

**Course Objectives**

1. To integrate the principles from genetic epidemiology with fundamentals epidemiological concepts in human health and disease.
2. Assess and formulate suitable and robust study designs and analytical methods to comprehend the link between genetic variation and the diversity of human traits.
3. To critically evaluate genetic association studies and interpret the significance of genetic variation across various in health, disease and population research.

**Learning Outcomes**

The student will be able to:

1. Apply the basic principles of genetic epidemiology on complex diseases or traits
2. Design genetic epidemiological studies and analyse the genetic data in relation to phenotypic variation.
3. Comprehend the importance of genetic association studies and the assertions concerning the significance of genetic variation across various common diseases

**Syllabus (theory)****Unit 1: Introduction to Genetic Epidemiology****12 Hours**

Role of Genetics in medicine, preventive medicine, public health, and epidemiology; Linkage disequilibrium; Hardy-Weinberg law; HapMap Project; Genome India Project; CDCV vs Rare variant hypothesis, Ethical, legal and social issues (ELSI) in genetic epidemiology.

**Unit 2: Study Designs****12 Hours**

Familial Aggregation Studies; Linkage Studies; Candidate gene approach; Association Studies; Genome-wide Association Studies (GWAS); Whole genome studies with respect to non-communicable diseases and traits, methodological challenges in genetic epidemiological issue (population stratification). Case-control; population based and longitudinal studies

**Unit 3: Gene and Environment****11 Hours**

Environmental factors in genetic epidemiological studies; DNA methylation; Genetics in drug targets; Epigenetic arrays, challenges in epigenetic epidemiology, Gene-environment interactions in complex diseases.

#### **Unit 4: Genetic Data**

**10 Hours**

Genotyping methods; Sequencing methods (NextGen sequencing); GWAS Catalog; Polygenic risk scores; DNA Biobanks; Statistical methods used in Genetic epidemiology; Software tools for genetic data analysis

#### **Practical - (30 hours)**

1. Sample Collection Preservation and storage
2. DNA Extraction and Quantification and Quality Assessment
3. SNP Genotyping using standard interaction techniques
4. DNA Sequencing (Sanger and NexGen)

#### **Suggested Readings**

1. Lyle J. Palmer, Paul R. Burton, George Davey Smith. An Introduction to Genetic Epidemiology. The Policy press, 2011
2. Melissa A. Austin, Terri H. Beaty, W. David Dotson. Genetic Epidemiology: Methods and Applications. CABI, 2013
3. Evangelos Evangelou. Genetic Epidemiology: Methods and Protocols. Humana Press (Springer Nature), New York, 2023
4. Juan Carlos Gomez-Verjan, Nadia A. Rivero-Segura. Principles of Genetics and Molecular Epidemiology. Springer Nature (Cham), 2022

#### **Keywords**

Genetic epidemiology, Public health, GWAS, Sequencing, Anthropology

**Semester-IV**  
**DSE-18**  
**Medical Anthropology**

| Course Title         | Total Credit | Credit distribution |           |
|----------------------|--------------|---------------------|-----------|
| Medical Anthropology | 04           | Theory              | Practical |
|                      |              | 03                  | 01        |

**Total Teaching Hours:** Theory – 45 hours (3 hours/week); Practical – 30 hours (2 hours/week)

**Learning Objectives**

- To introduce students to the concepts scope and theories, Medical Anthropology.
- To develop critical understanding of the interface between culture, health, disease, society, and healthcare systems of India.
- To familiarize students with ethnomedical practices, medical pluralism, and health-seeking behaviour in tribal, rural, and urban India.
- To analyse the impact of globalization, development, and biomedicine on tribal health systems.

**Learning Outcomes**

By the end of the course, students will be able to:

- Explain the concept and theoretical perspectives in Medical.
- Demonstrate knowledge of traditional healing systems and medical pluralism in India.
- Analyse socio-cultural, economic, and political factors influencing health, illness, and healthcare access in tribal, rural, and urban settings.
- Identify ethical issues in medical anthropological research and public health interventions.

**Keywords:** Medical pluralism, Ethnomedicine, Biocultural approach, Critical Medical Anthropology, Health-seeking behaviour, Sickness and illness, Healing rituals, AYUSH systems, Tribal medicine, Cultural epidemiology, Bioethics, Global health.

**Syllabus (theory)**

**Unit I: Theoretical Foundations of Medical Anthropology** (15 hours)

Meaning scope and development of Medical Anthropology: Biocultural, interpretive/symbolic, and critical medical anthropology perspectives, Evolution of Medical Anthropology in India: Contributions of Indian anthropologists and early ethnographic accounts.

## **Unit II: Ethnomedicine and Traditional Healing Systems** (10 hours)

Indigenous knowledge and ethnomedicine among tribal India (e.g., Naga, Bhil, Gond, Santal, and Andamanese communities). Healing rituals, shamanism, herbal medicine, and spiritual healing. Indian systems of medicine: Ayurveda, Siddha, Unani, Yoga, Naturopathy (AYUSH) and their interface with folk medicine. Medical pluralism: Co-existence and hierarchy of healing systems in rural and urban India; health-seeking behaviour and decision-making.

## **Unit III: Health, Society and Culture in India** (10 hours)

Cultural and Social dimensions of Tribal, Rural and Urban health, Medical anthropology of Infectious and Life style diseases with special reference to Tuberculosis, HIV/AIDS Malnutrition, Malaria, Sickle cell Anemia, Diabetes, social determinants of health and health inequalities.

## **Unit IV: Contemporary Issues, Applied Medical Anthropology and Ethics** (10 hours)

Political economy of health, structural violence, and health inequities in India. Global health, international policies, and their local implications, Applied Medical Anthropology: Role in public health programmes, disaster response, and community health interventions.

### **Practical. (1 Credit – 30 hours)**

The practical component focuses on hands-on training in medical anthropological methods through supervised fieldwork in nearby communities (rural/tribal/urban settlements in Delhi-NCR or during study tours).

1. Preparation of a research proposal on a health-related topic (e.g., ethnomedicine, maternal health, nutrition, or mental health).
2. Participant observation in a healthcare setting (PHC, traditional healer, or hospital OPD) and maintenance of a field diary.
3. Collection and analysis of illness narratives, case studies, and health-seeking behaviour data.

### **Suggested Readings**

1. **Anthropological Survey of India** publications and reports of the National Institute of Health and Family Welfare (NIHFW).
2. **Helman, C.G.** (2007). *Culture, Health and Illness* (5th ed.). Hodder Arnold.
3. **Kleinman, A.** (1980). *Patients and Healers in the Context of Culture*. University of California Press.
4. **McElroy, A., & Townsend, P.K.** (2015). *Medical Anthropology in Ecological Perspective* (6th ed.). Westview Press.
5. **Nichter, M.** (2008). *Global Health: Why Cultural Perceptions, Social Representations, and Biopolitics Matter*. University of Arizona Press.
6. **Quack, J., & Sax, W.S.** (Eds.). (2010). *The Anthropology of Healing*. Orient Black Swan.



## Semester-IV

### DSE-19

#### ANTHROPOLOGICAL PERSPECTIVES ON INDIAN KNOWLEDGE SYSTEMS (IKS)

| Course Title                                                          | Total Credit | Credit distribution |           |
|-----------------------------------------------------------------------|--------------|---------------------|-----------|
| <b>Anthropological perspectives on Indian Knowledge Systems (IKS)</b> | 04           | Theory              | Practical |
|                                                                       |              | 03                  | 01        |

#### Course Objective

- Develop a Critical understanding of the philosophical foundations of HIS including the concepts of "Vidya" (knowledge) and "Jnana" (wisdom) as understood in India.
- Examine & Deconstruct Colonial Narratives through Indian knowledge perspectives.
- Analysing Indian Knowledge System in holistic framework Religion, Science and Ecology

#### Learning Outcomes

- Critically appreciate IKS as systematic, empirical and critically grounded forms of knowledge
- Analyze IKS from anthropological, historical and interdisciplinary perspectives.
- Students' minds should be decolonised so they can recognise Indigenous Knowledge Systems as systematic, empirical, and culturally grounded forms of knowledge.

#### Unit 1 Philosophical Foundations of Indian Thoughts

**12 Hours**

Philosophical Roots :*Pramanas* in Nyaya School: Debate between folk science and western science; concept of *Vidya and Jnana* in Indian tradition. The anthropology of "Technological Knowledge" among artisanal communities (weaving, metallurgy, and architecture/Vastu); (The lost-wax casting (*Dhokra*) of Bastar and the geometry of Ikat weaving).

#### Unit 2: Ethno-Medicine and Indigenous Health Systems

**12 Hours**

Healing and ethnomedicine, the study of "Non-codified" knowledge systems among Central and North-Eastern tribal communities, Ayurveda and Siddha as local knowledge: Concept of body and health, humors (*Doshas*), and the concept of balance; the Sowa-Rigpa: Himalayan healing traditions.

#### Unit 3: Social Architecture and Knowledge Transmission

**11 Hours**

Guru-Shishya Parampara: An ethnographic study of lineage-based knowledge transmission (learning by apprenticeship), Orality vs. Literacy: The role of itinerant performers, *Kathas*, and folk theatre (*Yakshagana*, *Nautanki*) in disseminating ethical and social knowledge.

**Unit 4: Traditional Ecological Wisdom and Sustainable Practices****10 Hours**

Sacred Groves (Sarnasthal, *Devrai/Kavu*): Community-managed forest ecosystems and the ritual protection of biodiversity; Traditional Water Management: The anthropology of *Johads*, *Ahars*, and *Stepwells*; collective social action in water conservation, Vedic Agriculture and Ethno-Agronomy; Biopiracy and Traditional Knowledge.

**Practical**

1. Case study of a traditional craft, healing practice/ knowledge transmission system.
2. Documentation of an Indigenous knowledge system through ethnographic fieldwork.

**Suggested Reading:**

1. **Kakar, Sudhir** (1982), *Shamans Mystics and Doctors*
2. **Mahadeva,B., Bhat,V.R., and Pavanna R.N.**(2023). *Introduction to Indian Knowledge System*. PHI learning
3. **Marglin, F.A. and Apffel-Marglin, S.** (1990). *Dominating Knowledge: Development, Culture, and Resistance*.
4. **Saraswati, Baidyanath.** (1993). *Interface of Cultural Identity and Development*. IGNCA
5. **Srinivas, M.N.** (1966). *Social Change in Modern India*. University of California Press.
6. **Uberoi, J.P.S.** (1978). *Science and Culture*. Oxford University Press.
7. **Zimmermann, F.** (1987). *The Jungle and the Aroma of Meats: An Ecological Theme in Hindu Medicine*.

**Semester-IV****DSE-20****Environmental Health**

| Course Title and Code       | Total Credits | Credit distribution of the course |                     |
|-----------------------------|---------------|-----------------------------------|---------------------|
|                             |               | Lecture                           | Practical/ Practice |
| <b>Environmental Health</b> | <b>04</b>     | <b>03</b>                         | <b>01</b>           |

**Course Objective**

1. To familiarize students with the fundamental of environmental health concept.
2. To understand the relationships among human activities, the environment, and human health.
3. To emphasize on the activities related with sustainable development

**Course Learning Outcomes**

Students will be able to

1. Elucidate the various environmental hazards that impact human health
2. Understand the concepts of equity and sustainability as fundamental principles in the management of environmental health risks.
3. Evaluate global environmental transformations regarding their causes and the consequences they pose for human health.

**UNIT-1: Introduction****12 Hours**

Environmental hazards; Environmental health equity and inequality; Water and sanitation; Urban health; green infrastructure; household energy and health; Climate change and sustainable development; Dose-response relationship, one health approach and ecosystem health.

**UNIT-2: Pollution, Noise, WASH and Climate change****12 Hours**

Air/Water/Noise pollution, their health effects; health impacts and actions/interventions/policies on air pollution, WASH and climate change, National Clean Air Program; Pradhan Mantri Ujjwala Yojana. Exposure assessment methods.

**UNIT-3: Food, Chemicals, Biodiversity, Radiation, solid waste****11 Hours**

Safe and healthy food Practices. POSHAN Abhiyan; Food toxicity, Bio-social diversity, ecosystems and health; and transport, mobility and physical activity; Chemicals in the environment, health impacts and actions/interventions/policies on chemicals, radiation and solid waste including electronic waste, chemical risks assessment and management

**UNIT-4: Social Environments and Biological Impacts****10 Hours**

Occupational and workplace health; Healthy Cities/urban settlements; Housing; and health care facilities; Quality of life; Smart Cities Mission; Cultural resilience and Sustainable development

### **Practical**

1. Documentation of air, water or solid waste management practices.
2. Prepare a project report on topics related to environment and public health.
3. House hold survey on water, sanitation and hygiene (Wash) Practices.
4. GIS and Mapping –Preparation of a community environmental health map, Mapping water resources, disposal sites, pollution hotspots.

### **Suggested Readings**

1. Ray M. Merrill. Environmental Epidemiology: Principles and Methods (Jones & Bartlett Learning) (2008)
2. Dean Baker and Mark J. Nieuwenhuijsen. Environmental Epidemiology: Study Methods and Application (2008)
3. Howard Frumkin. Environmental Health: From Global to Local. Jossey-Bass (John Wiley & Sons), 2016 (3rd Edition)
4. Robert H. Friis. Essentials of Environmental Health. Jones & Bartlett Learning, 2018 (3rd Edition)
5. Barry S. Levy et al. Occupational & Environmental Health. Oxford University Press, 2017

### **Keywords**

Exposure, Dose-response, Environment, Ecology, health policy, Disease, Biological effects

**Semester-IV**

**GE-5**

**Anthropology of Cultural Heritage**

| Course Title and Code             | Total Credits | Credit Distribution of the Course |           |
|-----------------------------------|---------------|-----------------------------------|-----------|
|                                   |               | Lecture                           | Practical |
| Anthropology of Cultural Heritage | 04            | 03                                | 01        |

**Course Objectives**

1. To introduce students to the conceptual and theoretical foundations of cultural heritage from an anthropological perspective.
2. To explore heritage practices, archaeological contributions, and institutional frameworks at global and local levels.
3. To train students in basic heritage practices such as documentation, preservation, interpretation, and display.

**Learning Outcomes: Upon completion of this course, students will be able to:**

1. Define and distinguish between tangible, intangible, and natural heritage.
2. Understand the role of archaeology in heritage practices and its link to culture and politics.
3. Apply heritage documentation and conservation techniques and critically evaluate heritage-related issues, including power dynamics, tourism, and conflicts.

**Course Content**

**Unit I: Understanding Heritage**

**12 Hours**

Conceptualising 'heritage', Types/ Tangible, intangible, and natural heritage;

History and development of heritage studies;

Archaeology and Heritage; sites, objects, practices ;

UNESCO Heritage sites;

Heritage as a resource and commodity: experiences and souvenirs;

Tourism and natural heritage: impact, opportunities and challenges;

Eco-tourism and sustainable approaches to heritage;

**Unit II: Conservation, Museums, and Display**

**12 Hours**

Evolution of museums and their role in heritage  
 Acquisition, management, and conservation of collections  
 Exhibition, display, and cultural representation  
 Challenges in cross-cultural conservation

**Unit III: Historical and Socio-Political Dimensions of Heritage** **11 Hours**

Colonialism and the documentation of material culture  
 Heritage as a tool of both domination and resistance; Heritage regimes and discourses  
 Nationalism and heritage  
 Debates on global heritage and representation; heritage, belonging and identity.  
 Debates on the repatriation of cultural property and restitution

**Unit IV: Heritage, in India** **10 Hours**

India's history of cultural and heritage preservation  
 Overview of India's current policies on cultural and heritage preservation  
 Implications of India's current policies on cultural and heritage preservation  
 Examples of tangible and intangible heritage in India  
 Examples of natural heritage in India  
 Challenges in the conservation of Indian culture

**Practical** **30 Hours**

1. Field documentation of local heritage (tangible/intangible/natural)
2. Analysis of heritage sites and artefacts using anthropological tools
3. Simulated heritage exhibition: design and interpretive strategies
4. Policy review: comparison of heritage policies (e.g., India, UNESCO)

**Core Readings**

1. Boylan, P. (Ed.). (2004). *Running a Museum: A Practical Handbook*. Paris: ICOM.
2. Harrison, R. (2010). *Understanding the politics of heritage*. Manchester University Press.
3. Labadi, S. (2007). Representations of the nation and cultural diversity in discourses on world heritage. *Journal of Social Archaeology*, 7(2), 147–170.
4. Meskell, L. (Ed.). (2015). *Global Heritage: A Reader*. Wiley-Blackwell.
5. Pearce, S. (1994). Objects as meaning; or narrating the past. In Pearce, S. (Ed.), *Interpreting Objects* (pp. 19–29). New York: Routledge.

### Suggested Readings

1. Appiah, K. A. (2006). “Whose Culture Is It?” *New York Review of Books*.
2. Clifford, J. (1988). *The Predicament of Culture*. Harvard University Press.
3. Arnold, B. (1999). The contested past. *Anthropology Today*, 15(1), 1-4.  
<https://doi.org/10.1111/1467-8322.00041>
4. Harvey, D. C. (2001). Heritage pasts and heritage presents: Temporality, meaning and the scope of heritage studies. *International Journal of Heritage Studies*, 7(4), 319–338.  
<https://doi.org/10.1080/13581650120105534>
5. Hoskins, J. (1997). *Biographical Objects: How Things Tell the Stories of People’s Lives*. New York: Routledge.
6. Pedersen, A. (2002). *Managing Tourism at World Heritage Sites: A Practical Manual for World Heritage Site Managers*. UNESCO World Heritage Centre.

**Keywords:** Heritage, Archaeology, Tangible and Intangible Culture, Museums, Repatriation, Cultural Policy, Conservation, World Heritage, Tourism, Colonialism, Display Practices.

**GE-6****Society and Culture in Vedic Times**

| Course Title and Code                                             | Total Credits | Credit distribution of the course |           |
|-------------------------------------------------------------------|---------------|-----------------------------------|-----------|
|                                                                   |               | Lecture                           | Practical |
| <b>Society and Culture in Vedic Times</b><br>(Vedic Anthropology) | <b>04</b>     | <b>03</b>                         | <b>01</b> |

**Course Objectives**

1. To understand the foundations of society and culture in Vedic times
2. To explore human societies, cultures, civilizations, ethics, and traditions through Vedic sources
3. To compare Vedic and modern anthropological perspectives.

**Learning Outcomes**

1. To appreciate the Vedic knowledge for maintaining the social harmony
2. To gain interdisciplinary research qualities integrating anthropology, history, ethics, philosophy etc.
3. To conduct basic research on Vedic traditions

**Syllabus (Theory)****Unit-I: Introduction to Society and Culture in Vedic Times****12 Hours**

Nature of Vedic texts; Outline and exploration of Vedic Sources: Vedas, Upanishads, Puranas, Itihasas, Smritis; Vedic views on Human Evolution vs. Scientific Theories; Four Yugas (Satya, Treta, Dwapara, Kali) as a Timeline for Civilizational Growth; Vedic Society; Role of Women: Gargi, Maitreyi, Lopamudra, and Sulabha's contributions

**Unit-II: Ethics, Morality, and Law****12 Hours**

Dharma, Artha, Karma, Moksha as Ethical Foundations; Concept of Rita (Cosmic Order) and Nyaya (Justice); Vedic Principles of Governance and Kingship; Comparative Analysis of Vedic Ethical Systems

**Unit-III: Rituals, Culture, and Traditions****11 Hours**

Yajnas and their socio-cultural significance; Samskaras (Rites of Passage) – Birth to Death; Festivals and their Anthropological Relevance; Vedic Concept of Art, Music, and Architecture

**Unit-IV: Environment and Nature in Vedic Thought****10 Hours**

Vedic concept of Ecology and Sustainability; Sacred Rivers, Forests and animals in Hindu Tradition; Relevance of Ayurveda and traditional healing

**Practical****30 Hours**

Project report based on data collection related to Vedic knowledge, Samskaras, Art, Music, and Architecture

### Core Readings

1. Griffiths, A., & Houben, J. E. (2004). *The Vedas. Text, Language and Ritual*.
2. Vivekananda, S., & Madhurananda, S. (2016). *Bhagavad Gita as viewed by Swami Vivekananda*. Advaita Ashrama (A publication branch of Ramakrishna Math, Belur Math).
3. Manusmriti – Ethics & Social Order
4. *Ranchor Prime* (1996). *Hinduism and ecology: Seeds of truth*. Motilal Banarsidass Publishing House.
5. Basham, A. L., & Rizvi, S. A. A. (1956). *The wonder that was India*. London: Sidgwick and Jackson.

### Suggested Readings

1. Medhananda, S. (2021). *Swami Vivekananda's vedāntic cosmopolitanism*. Oxford University Press.
2. Swami Vivekananda's Views on Vedic Wisdom in the Modern Age
3. Introduction to the Vedas – Swami Dayananda
4. Selections from Manusmriti
5. Gargi & Maitreyi in the Upanishads
6. Bhagavad Gita – Teachings on Dharma
7. Arthashastra on Law and Governance
8. Taittiriya Upanishad – Rites & Rituals

### Keywords

Vedas, Yugas, Ashramas, Yajnas, Ethics, Morality.

| Curriculum Structure of 2nd Year of PG for Two years PG Programme (3+2) OR |            |       |                                      |         |  |                                      |                                                |       |         |
|----------------------------------------------------------------------------|------------|-------|--------------------------------------|---------|--|--------------------------------------|------------------------------------------------|-------|---------|
| One Year PG Programme After Completion of Four-Year UG Programme (4+1)     |            |       |                                      |         |  |                                      |                                                |       |         |
| Structure-3 (Level-6.5): PG Curriculum Structure with only Research        |            |       |                                      |         |  |                                      |                                                |       |         |
| Level-6.5                                                                  | Year-2     |       |                                      |         |  | Year-2                               |                                                |       |         |
|                                                                            |            |       | Paper                                | Credits |  |                                      |                                                | Paper | Credits |
|                                                                            | Semester-3 | DSC-1 | Advances in Anthropological Theories | 4       |  | Semester-4                           | DSC--                                          |       |         |
|                                                                            |            |       |                                      |         |  |                                      |                                                |       |         |
|                                                                            |            |       |                                      |         |  |                                      |                                                |       |         |
|                                                                            |            |       |                                      |         |  |                                      |                                                |       |         |
|                                                                            |            |       |                                      |         |  |                                      |                                                |       |         |
|                                                                            |            |       | One DSE from the available Courses   | 4       |  | DSE-                                 | Anthropology in Practice                       |       | 4       |
|                                                                            |            |       |                                      |         |  |                                      | Or any other paper available from existing DSE |       |         |
| Research methods / tools                                                   |            |       |                                      |         |  |                                      |                                                |       |         |
|                                                                            |            |       | Advanced Research Methodology        | 4       |  | Techniques of Research writing       |                                                |       | 2       |
|                                                                            |            |       |                                      |         |  |                                      |                                                |       |         |
|                                                                            |            |       | One intensive problem based research | 10      |  | One intensive problem based research |                                                |       | 16      |
|                                                                            |            |       | As per Outcomes listed below         |         |  |                                      |                                                |       |         |
|                                                                            |            |       |                                      | 22      |  |                                      |                                                |       | 22      |

## Semester-III

### DSC-I

#### Advances in Anthropological Theories

| Course Title                                | Total Credit | Credit distribution |          |
|---------------------------------------------|--------------|---------------------|----------|
| <b>Advances in Anthropological Theories</b> | 04           | Theory              | Tutorial |
|                                             |              | 03                  | 01       |

#### Learning Objectives

- To provide an advanced, integrative understanding of cutting-edge theoretical paradigms spanning evolutionary biology, contemporary socio-cultural critiques, and indigenous Indian philosophies.
- To equip research students with the analytical tools to bridge the nature-culture divide by examining the dialogue between behavioral ecology, paleoanthropology.
- To foster theoretical pluralism and decolonial reflexivity by critically evaluating Western anthropological models against classical and heterodox Indian frameworks of knowledge, society, and the self.

#### Learning Outcomes

By the end of this course, students will be able to:

- Synthesize core debates in hominin evolution, ancient genetics, and primate behavioral ecology to interpret the bio-cultural foundations of human behavior.
- Deconstruct dominant ethnographic authority and deploy contemporary theories of embodiment, and multi-species ontologies.
- Formulate original, epistemologically diverse research designs by utilizing classical Indian philosophical paradigms (*Pramana*, *Anekantavada*) alongside contemporary cross-cultural social theories.

#### Course Content

##### Unit I: Integrated Paradigms in Biological Anthropology and Hominin Evolution 12 Hours

- Primate Behavioral Ecology & Culture: Evolutionary models of primate social systems, socio-sexual behavior; theoretical debates on non-human primate tool use, proto-culture, and cognitive evolution.
- Hominin Speciation & Cryptic Lineages: The *Australopithecus* to early *Homo* transition; cryptic hominin lineages (*Denisovans*, *Homo naledi*) and the hominin radiation.
- Evolutionary Modernity & Bio-Cultural Interaction: Multi-regional evolution versus Out-of-Africa models; the ancient DNA (aDNA) revolution and archaic introgression frameworks; bio-cultural perspectives on the emergence of language, symbolic behavior, and the agricultural transition.
- Conservation Primatology: Anthropogenic pressures on habitats, population fragmentation dynamics, and theoretical frameworks for community-based primate conservation.

##### Unit II: Phenomenology, Embodiment, and Political Economy 12 Hours

- The Phenomenological Turn & Embodiment: Moving beyond passive structural replication to embodiment as a primary paradigm; Experiencing Culture; Thomas Csordas, Nancy Scheper-Hughes and Margaret Lock.

- The Dwelling Perspective & Sensory Anthropology: Tim Ingold's critique of cognitive/cognitive-mapping models of culture; the ecology of practice and the "dwelling perspective"; the sensory turn in ethnography (David Howes, Paul Stoller).

### Unit III: Postmodernism and the Ontological Turn

11 Hours

- The Postmodern Critique: The *Writing Culture* debate (James Clifford, George Marcus); the crisis of representation, experimental writing strategies, and reflexive ethnography.
- Post-Colonial Interventions: Decolonizing anthropology; subaltern perspectives, gendered subjectivities, and the critique of Eurocentric academic categories.
- The Ontological Turn: Multi-species ethnography, post-humanism (Bruno Latour, Eduardo Viveiros de Castro), and moving beyond the historic Western nature-culture dualism.

### Unit IV: Indigenous Epistemologies and Indian Philosophical Thought

10 Hours

- Concepts of the Self, Mind, and Consciousness: The *Atman-Brahman* continuum in Vedanta versus the *Anatta* (non-self) doctrine in Buddhism; the *Purusha-Prakriti* dualism in Samkhya philosophy as an alternative paradigm for studying human behavior, agency, and the material world.
- Social Stratification and Moral Orders: Anthropological deconstruction of *Dharma* (cosmic/moral duty) and *Karma* (causal moral action) as organizing principles of social action, behavior, and structural hierarchies; Buddhist social thought.
- Indigenous Epistemologies & Methods of Knowledge: *Pramana* frameworks (modes of acquiring valid knowledge: *Pratyaksha* / perception, *Anumana* / inference, *Shabda* / testimony) as tools for cross-cultural ethnographic inquiry; *Anekantavada* (the Jaina doctrine of the plurality of viewpoints) as a precursor to multi-perspectival interpretive anthropology. Spiritual Universalism & Practical Vedanta: Ramakrishna Paramhansa, Swami Vivekananda and Sri Aurobindo.
- Indigenizing Indian Anthropology: Tracing the roots of an "Indian approach" to society through the works of early academic pioneers: S. C. Roy; N. K. Bose, S. C. Dube, Irawati Karve..

### Suggested Reading

1. Clifford, J., & Marcus, G. E. (Eds.). (1986). *Writing Culture: The Poetics and Politics of Ethnography*. University of California Press.
2. Conroy, G. C., & Pontzer, H. (2012). *Reconstructing Human Origins: A Modern Synthesis* (3rd ed.). W. W. Norton & Company.
3. Csordas, T. J. (1994). *Embodiment and Experience: The Existential Ground of Culture and Self*. Cambridge University Press.
4. Dasgupta, S. (1922). *A History of Indian Philosophy* (Vol. 1). Cambridge University Press.
5. Guha, R. (1982). *Subaltern Studies: Writings on South Asian History and Society*. Oxford University Press.
6. Hiriyan, M. (1993). *Outlines of Indian Philosophy*. Motilal Banarsidass.
7. Ingold, T. (2000). *The Perception of the Environment: Essays on Livelihood, Dwelling and Skill*. Routledge.
8. Latour, B. (2005). *Reassembling the Social: An Introduction to Actor-Network-Theory*. Oxford University Press.
9. Mukerjee, R. (1951). *The Indian Scheme of Life*. Hind Kitabs.
10. Rolland, R. (1929). *The Life of Ramakrishna and The Life of Vivekananda*. Advaita Ashrama.
11. Sachidananda Mohanty 2018: Sri Aurobindo: A Contemporary Reader by Routledge India
12. Strier, K. B. (2021). *Primate Behavioral Ecology* (6th ed.). Routledge.

### Tutorials

1. Students must present a critical review of at least two classic or contemporary monograph selected monograph from the reading list
2. Research Proposal Drafting: Students should design an empirical research proposal linking the theoretical tenets of Course I with the applied problematic of Course II.

## Semester-III

### Advanced Research Methodology

| Course Title                  | Total Credit | Credit Distribution |           |
|-------------------------------|--------------|---------------------|-----------|
| Advanced Research Methodology | 04           | Theory              | Practical |
|                               |              | 03                  | 01        |

#### Course Objectives:

1. Understand advanced concepts and theoretical foundations of anthropological research
2. Integrate qualitative, quantitative, and holistic research methodologies
3. Develop competence in the tools and techniques used for the data collection in the field.
4. To develop competence in the advanced laboratory research techniques
5. To Apply the ethical principles in data collection and analysis.

#### Learning Outcomes:

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

1. Explain advanced concepts and theories of anthropological research
2. Apply qualitative, quantitative, and holistic research methodologies
3. Demonstrate proficiency in advanced field data collection techniques
4. Perform advanced laboratory research techniques
5. Apply ethical principles in anthropological research

#### Part I: Advanced Research Methodology

##### Unit 1: Holistic Foundations

**12 Hours**

Holism in anthropological methodology; Interface of biology, race, language, culture, and history. Philosophical foundations; Positivism, Relativism, Scientificism and beyond. The tension between objective social science and subjective meaning-making in anthropological research. Contemporary epistemic Synthesis; Assemblages, & cosmologies and local Biologies in anthropological research

##### Unit 2: Methodological Paradigms

**12 Hours**

Technique, methods, and methodology distinguished; Logics of inference, Bio-social approach in anthropological research, Evolutionary and ecological paradigms; Epigenetics. Epistemological foundations of behavioral ecology, and debates around health and diseases. Paleopathology.

#### PART II: Advanced Research Tools and Techniques

##### Unit 3: Ethnographic Methods and Fieldwork Techniques

**10 Hours**

Moving beyond basic participant observation, Multi-Sited and Sensory ethnography use of visuals soundscapes, photography, as data collection tools and analytical frameworks. Documentation of Narratives – Verbal and Non-verbal. Life History, case study, Interview, Questionnaires, house hold sensors, oral histories, genealogies, pedigree. Taking Field Notes and its Analysis.

##### Unit 4: Biological Anthropological Techniques

**11 Hours**

Field-Based Anthropometry; Stress & Metabolic Biomarkers; Forensic & Skeletal Analysis; Molecular & Demography Toolkits; Ethics in Biocultural Research; conflicting ethical dilemmas that emerge when a researcher operates simultaneously as a social qualitative ethnographer and an empirical biomedical researcher, Stable isotope analysis to study Ancient DNA, Methods of dating the fossils, AI and machine learning applications, use of statistical techniques.

## Practical

30 Hours

1. **Standardizing Morphological Measurements:** Precision tracking of linear, transverse, and circumferential body parameters using standard anthropometers, skinfold calipers (and sliding/spreading calipers; Skinfold Analysis & Body Composition Pigmentation mapping (skin, hair, and eye color coding via spectrophotometry indices or visual scales), facial profiles (nasal form, lip thickness, alveolar prognathism), and body typing via Heath-Carter somatotyping methods. Indian perspectives of classifying human body and its constituents.
2. **Developing high-level qualitative toolkits,** transforming standard observation into robust, systematic data inscription suitable for deep ethnographic analysis; Craft of Inscription: Transforming raw experiential observation into systematic data. Formulating open-ended, deep interview matrices designed to capture life histories, genealogies of practice, and complex personal trajectories; Reading Ethnography

## Suggested Readings

1. **Bernard, H. Russell.** (2017). *Research Methods in Anthropology: Qualitative and Quantitative Approaches* (6th ed.). Rowman & Littlefield.
2. **Blakey, Michael L.** (2020). "Archaeology under the Blinding Light of Race," *Current Anthropology*, 61(S22), S183–S197. (Core epistemological reading on the biocultural politics of the body). *Countries, Four Decades, Four Great Transformations*. University of California Press.
3. **Clifford, James, & Marcus, George E. (Eds.).** (1986). *Writing Culture: The Poetics and Politics of Ethnography*. University of California Press.
4. **Geertz, Clifford.** (1973). *The Interpretation of Cultures*. Basic Books. (Specifically "Thick Description: Toward an Interpretive Theory of Culture").
5. **Smith, Linda Tuhiwai.** (2021). *Decolonizing Methodologies: Research and Indigenous*
6. **Goodman, Alan H., & Leatherman, Thomas L. (Eds.).** (1998). *Building a New Biocultural Synthesis: Political-Economic Perspectives on Human Biology*. University of Michigan Press. (The foundational text for Unit 1). *Peoples* (3rd ed.). Zed Books.
7. **Ulijaszek, Stanley J., & Mascie-Taylor, C. G. N. (Eds.).** (2005). *Anthropometry: The Individual and the Population*. Cambridge University Press.

## Semester-IV

### DSC--

#### Anthropology in Practice

| Course title             |  | Total Credit | Credit distribution |           |
|--------------------------|--|--------------|---------------------|-----------|
| Anthropology in Practice |  | 04           | Theory              | Practical |
|                          |  |              | 03                  | 01        |

**Total teaching hours:** Theory- 45 hours (04 hours per week); Practical- 3 hours per week

#### Course objectives

- To understand the relevance of anthropology in present day scenario.
- To study the scope and impact of anthropology on different spheres of life.

#### Learning outcomes

- By course end, students will come to know new fields in anthropology and their relevance in human life.

#### Syllabus (Theory)

##### Unit I: Academic and practising anthropology (10 hours)

Differences, structure, activities, issues (scope and applications).

##### Unit II: Role of anthropology Public Policy (12 hours)

Community development, NGOs, Tourism anthropology, Media anthropology.

##### Unit III: Trends in Anthropology (12 hours)

Designing and Fashion, gender disparity, management anthropology; cyber studies; neuro-anthropology; Anthropology of aging; cognitive anthropology.

##### Unit IV: Role of biological anthropology in human development (11 hours)

Genetic counselling, Biological variability of Indian population admixture, migration and sub-structure variation, Reproductive health; Life style diseases and quality of life.

#### Practical

1. Write a project on community development.
2. List five NGOs and describe their functioning in social welfare activities.
3. Write a project on religious tourism/ health tourism/ tribal tourism.
4. Collect any evidence on human rights and make a report.
5. Collect the genetic information and make the pedigree and highlight the roles of genetic counsellor.

## Suggested Readings

1. Kertzer, D.I. and Fricke, T.E. eds., 1997. *Anthropological demography: Toward a new synthesis*. University of Chicago Press.
2. Census of India (2001, 2011) and National Family Health Survey (2006, 2010).
3. Ervic Alexander M. (2000). *Applied Anthropology: Tools and Perspectives for Contemporary Practise*, Boston, MA: Allyn and Bacon.
4. Erwin, A. (2004). *Anthropology Tools and Practice*, Allyn and Bacon.
5. Margaret, A. G. (2003). *Applied Anthropology: A Career-Oriented Approach*, Boston, MA: Allyn and Bacon.
6. Vidyarthi, L. P., & Sahay, B. N. (2001). *Applied Anthropology and Development in India*, National Publishing House, New Delhi.
7. Vidyarthi, L. P., (1990). *Applied Anthropology in India- Principles, Problems and Case studies*, Kitab Mahal, UP.

**Semester IV**  
**Techniques of Research Writing**

| Course Title                   | Total Credit | Credit Distribution |
|--------------------------------|--------------|---------------------|
| Techniques of Research Writing | 02           | Theory - 2          |

### Course Objectives

This course aims to equip students with the conceptual and operational skills necessary to analyse the empirical data and laboratory findings in the light of anthropological theories and present them in terms of academic writing. The course aims to:

- (i) To familiarize students with the techniques of research writing for peer-reviewed journal articles and research papers;
- (ii) To familiarize students with writing proposals for research grants, and for ethnographic or laboratory based research projects; and
- (iii) To train students to effectively synthesize fields, laboratory, or qualitative data with abstract anthropological and evolutionary theories.

### Learning Outcomes

By the end of the course, students will be able to:

- (i) Draft clear, concise and analytically rigorous research papers.
- (ii) Able to hypothesize and formulate statements on relationship between variables across sub-disciplines.
- (iii) Write, revise, and structure academic papers that adhere to the specific style, data presentation, and citation standards of reputed anthropology journals.

### Syllabus (Theory)

#### Unit I: Anthropological Arguments and Writing Structure

Translating fieldwork ideas or laboratory inquiries into structured research problems; Framing research objectives that are precise, measurable and theoretically grounded; Formulating testable hypotheses and identifying relationships between variables for scientific queries; Writing critical literature reviews; and Positioning one's work within ongoing anthropological debates in the light of conceptual and theoretical frameworks.

Structuring Diverse Formats: (i) *The Socio-Cultural Framework*: The narrative architecture of an academic paper (Introduction, Background, Methodology, Data/Analysis in the light of conceptual and theoretical framework, Discussion/Conclusion); (ii) *The Biological Framework*: Introduction (scoping the hypothesis), Materials and Methods (reproducibility and sample diversity), Results (objective data reporting), and Discussion (contextualizing biological findings within evolutionary or bio-cultural frameworks).

*Integrative perspective*: Combining the biological, cultural, linguistic, and archaeological data.

## Unit II: Data Visualization and Ethics

- Writing Ethnography vs. Reporting Quantitative Data: Textualizing fieldnotes and qualitative case studies versus the written presentation of cultural, biological, and archaeological data.
- Visualizing Data in Biological Anthropology: Integrating and describing statistical tables, osteometric charts, somatoscopic indices, and pedigrees; the art of writing concise, self-contained captions for figures and graphs.
- Ethics: Anonymization, protection of vulnerable populations, ethical handling of sensitive data, informed consent, institutional Ethics Committees / IRB, conflict of interest

### Suggested Readings

1. American Journal of Biological Anthropology. *Guidelines for Authors*. Wiley Periodicals LLC. (*Crucial for understanding formatting, data-sharing policies, and structure specific to the sub-discipline*).
2. Becker, Howard S. (2020). *Writing for Social Scientists: How to Start and Finish Your Thesis, Book, or Article*. University of Chicago Press.
3. Clifford, James, & Marcus, George E. (Eds.). (1986). *Writing Culture: The Poetics and Politics of Ethnography*. University of California Press.
4. Day, Robert A., & Gastel, Barbara. (2016). *How to Write and Publish a Scientific Paper*. Cambridge University Press. (*The definitive guide for mastering the IMRaD structure, writing abstracts, and presenting quantitative data/graphs*).
5. Belcher, Wendy Laura. (2019). *Writing Your Journal Article in Twelve Weeks* (2nd ed.). University of Chicago Press.
6. Council of Science Editors. (2018). *Scientific Style and Format: The CSE Manual for Authors, Editors, and Publishers* (8th ed.). University of Chicago Press.

| Curriculum Structure of 2nd Year of PG for Two years PG Programme (3+2) OR |            |                                                                                  |                                                              |         |            |                                                                                  |                                                    |         |
|----------------------------------------------------------------------------|------------|----------------------------------------------------------------------------------|--------------------------------------------------------------|---------|------------|----------------------------------------------------------------------------------|----------------------------------------------------|---------|
| One Year PG Programme After Completion of Four-Year UG Programme (4+1)     |            |                                                                                  |                                                              |         |            |                                                                                  |                                                    |         |
| Structure-1 (Level-6.5): PG Curriculum Structure with only Course Work     |            |                                                                                  |                                                              |         |            |                                                                                  |                                                    |         |
| Level-6.5                                                                  | Year-2     |                                                                                  |                                                              |         | Year-2     |                                                                                  |                                                    |         |
|                                                                            |            |                                                                                  | Paper                                                        | Credits |            |                                                                                  | Paper                                              | Credits |
|                                                                            | Semester-3 | DSC-7                                                                            | Instrumental Techniques in Forensic Analysis - I             | 4       | Semester-4 | DSC-9                                                                            | Instrumental Techniques in Forensic Analysis - II  | 4       |
|                                                                            |            | DSC-8                                                                            | Introduction to Digital and Cyber Forensics                  | 4       |            | DSC-10                                                                           | Questioned Documents and Multimedia Forensics      | 4       |
|                                                                            |            |                                                                                  |                                                              | 8       |            |                                                                                  |                                                    | 8       |
|                                                                            |            | Students can OPT for either 3 New DSEs, OR 2 New DSEs & 1 GE from the list below |                                                              |         |            | Students can OPT for either 3 New DSEs, OR 2 New DSEs & 1 GE from the list below |                                                    |         |
|                                                                            |            | DSE-5                                                                            | Human Genetics and Molecular Forensics                       | 4       |            | DSE-11                                                                           | Forensic Toxicology and Pharmacology               | 4       |
|                                                                            |            | DSE-6                                                                            | Forensic Genomics, Proteomics and Bioinformatics             |         |            | DSE-12                                                                           | Forensic Accounting                                |         |
|                                                                            |            | DSE-7                                                                            | Advanced Forensic Anthropology                               | 4       |            | DSE-13                                                                           | Forensic Analytical Chemistry                      | 4       |
|                                                                            |            | DSE-8                                                                            | Forensic Engineering                                         |         |            | DSE-14                                                                           | Cryptography & Steganography                       |         |
|                                                                            |            | DSE-9                                                                            | Advanced Techniques in Crime Scene Investigation             |         |            | DSE-15                                                                           | Research Methodology                               |         |
|                                                                            |            | DSE-10                                                                           | Disaster Victim Identification                               |         |            | DSE-16                                                                           | Forensic Narcotics Analysis                        |         |
|                                                                            |            |                                                                                  |                                                              |         |            | DSE-17                                                                           | Biometric Systems of Identification                |         |
|                                                                            |            | GE-3                                                                             | Fundamentals of Immunological techniques in Forensic science | 4       |            | GE-5                                                                             | Fundamentals of Nanotechnology                     | 4       |
|                                                                            |            | GE-4                                                                             | Fundamentals of AI and Machine Learning in Forensic science  |         |            | GE-6                                                                             | Forensic Medicine                                  |         |
|                                                                            |            |                                                                                  |                                                              | 12      |            |                                                                                  |                                                    | 12      |
|                                                                            |            | One Skill Based/Workshop/Specialized Laboratory/Hands on Learning                |                                                              |         |            | One Skill Based/Workshop/Specialized Laboratory/Hands on Learning                |                                                    |         |
|                                                                            |            |                                                                                  |                                                              |         |            |                                                                                  |                                                    |         |
|                                                                            |            | SEC--1                                                                           | Optical Techniques with Laboratory training                  | 2       |            | SEC--4                                                                           | Digital Evidence Analysis with Laboratory training | 2       |
|                                                                            |            | SEC--2                                                                           | Separation Techniques with Laboratory training               |         |            | SEC--5                                                                           | Evidence Handling with Laboratory training         |         |
|                                                                            |            | SEC--3                                                                           | Formulation of Research Design                               |         |            | SEC--6                                                                           | Big data Analysis in Forensic Science              |         |
|                                                                            |            |                                                                                  |                                                              | 22      |            |                                                                                  |                                                    | 22      |
|                                                                            |            |                                                                                  |                                                              |         |            |                                                                                  |                                                    |         |

## **Structure 1 (Course Work Only)**

### **SEM-III**

## DSC - 7 INSTRUMENTAL TECHNIQUES IN FORENSIC ANALYSIS - I

| Paper                                            | Total Credit | Lecture | Practical/ Practice | Pre-requisite of the course         |
|--------------------------------------------------|--------------|---------|---------------------|-------------------------------------|
| Instrumental Techniques in Forensic Analysis - I | 04           | 03      | 01                  | Basic knowledge of Forensic Science |

### Course Outcomes:

Upon successful completion of this course, students will be able to:

1. Understand the principles and working mechanisms of major instrumental techniques used in forensic science.
2. Explain the applications of microscopy, spectroscopy, electrophoresis, and chromatography in forensic evidence analysis.
3. Develop practical skills in the operation of basic analytical instruments and interpretation of analytical data.
4. Evaluate the suitability, accuracy, and limitations of instrumental techniques for forensic investigations

### Learning Objectives:

After completing the course, students will be able to:

1. Explain the principles and instrumentation of commonly used forensic analytical techniques.
2. Select appropriate instrumental methods for the examination of different types of forensic evidence.
3. Interpret analytical results obtained from spectroscopic, chromatographic, microscopic, and electrophoretic techniques.
4. Demonstrate laboratory competency in sample preparation, instrument handling, and forensic data interpretation.

### Unit 1 Light Microscopy (12 Hours)

Introduction to microscopy, theory and principles of microscopy, Construction, working, and applications of Simple, Compound, Comparison, Fluorescence, Polarized, Stereo and infrared microscopes, Digital microscopy and image analysis in forensic examinations.

### Unit 2 Molecular Spectroscopy (11 Hours)

Introduction to molecular microscopy, theory, principles and application of UV, VIS spectroscopy, IR spectroscopy, Fourier Transform Infrared spectroscopy (FTIR) and Raman

spectroscopy, Applications of molecular spectroscopy in forensic examination of drugs, fibers, paints, inks, and explosives.

### **Unit 3 Electrophoresis (11 Hours)**

Introduction, theory, principle and application of Cross-over electrophoresis, Agarose gel electrophoresis, Polyacrylamide gel electrophoresis, Sodium dodecyl sulphate (SDS) polyacrylamide gel electrophoresis, Pulse field gel electrophoresis, Capillary electrophoresis, Immuno- electrophoresis, Iso-electric focusing.

### **Unit 4 Chromatography (11 Hours)**

Introduction, theory, principle, instrumentation, and forensic applications of Thin Layer Chromatography (TLC), HPTLC, Paper and Column chromatography, High performance liquid chromatography, LC-MS, Ion chromatography. Gas chromatography: Pyrolysis GC, GC-MS, Introduction to Headspace Gas Chromatography (HS-GC) for alcohol and volatile poison analysis.

### **Practical's (30 Hours)**

1. Identification of natural and synthetic fibers using a microscope.
2. To find out the unknown concentration of the given sample using a UV/Vis Spectrophotometer.
3. To study Beer's Lambert's law.
4. To study the Hypochromic and Bathochromic shift using a UV/Vis Spectrophotometer.
5. To study the TLC of different inks of the writing pen.
6. To perform gel electrophoresis of DNA samples
7. To analyses the given compound using FTIR spectra.
8. To perform TLC of phenolphthalein.
9. Quantitative and qualitative analysis of soils from different sources of origin.
10. Differentiation of various toxic textile dyes using FTIR analysis.

**Assessment Method:** As per University guidelines

### **Suggested Readings:**

1. Skoog, D. A., Holler, F. J., & Crouch, S. R. (2021). *Principles of Instrumental Analysis* (7th ed.). Cengage Learning.
2. Hofmann, A., & Clokie, S. (2018). *Wilson and Walker's Principles and Techniques of Biochemistry and Molecular Biology* (8th ed.). Cambridge University Press.
3. Rouessac, F., & Rouessac, A. (2021). *Chemical Analysis: Modern Instrumentation Methods and Techniques* (3rd ed.). Wiley.
4. Saferstein, R. (2023). *Criminalistics: An Introduction to Forensic Science* (13th ed.). Pearson.
5. Bell, S. (2022). *Forensic Chemistry* (3rd ed.). Pearson.
6. Houck, M. M., & Siegel, J. A. (2015). *Fundamentals of Forensic Science* (3rd ed.). Academic Press.
7. Peterson J.R and Mohammad A.A (2001); Clinical and Forensic Application of Capillary Electrophoresis. Springer.
8. Lurie B.J and Wittwer J.D (1983); High Performance Liquid Chromatography in Forensic Chemistry. Taylor and Francis.
9. Newman R, Gilbert M, Gilbert M.W., and Lothridge K (1997); GC-MS guide to Ignitable 4

- Liquids. CRC Press.
10. Brown, P. R. (2004); Advances in chromatography.
  11. Grahm D. (1973); The use of X-ray Techniques in Forensic Investigation.
  12. Settle F.A (1997); Handbook of Instrumental Techniques for Analytical Chemistry. Prentice Hall.

### **DSC-8 INTRODUCTION TO DIGITAL AND CYBER FORENSICS**

| <b>Paper</b>                                       | <b>Total Credit</b> | <b>Lecture</b> | <b>Practical/ Practice</b> | <b>Pre-requisite of the course</b> |
|----------------------------------------------------|---------------------|----------------|----------------------------|------------------------------------|
| <b>Introduction to Digital and Cyber Forensics</b> | <b>04</b>           | <b>03</b>      | <b>01</b>                  | Basic knowledge of Computers       |

#### **Course Outcomes:**

Upon successful completion of this course, students will be able to:

1. Understand the fundamental concepts of digital and cyber forensics and the nature of digital evidence.
2. Explain computer architecture, operating systems, networks, and cybercrimes from a forensic perspective.
3. Apply basic principles of digital evidence acquisition, preservation, and cyber incident investigation.
4. Understand cybersecurity principles, legal aspects, and the use of forensic tools in cybercrime investigations

#### **Learning Objectives:**

After completing this course, students will be able to:

1. Describe the fundamentals of digital forensics, cyber forensics, and digital evidence.
2. Examine computer systems, storage media, operating systems, and networks relevant to forensic investigations.
3. Identify common cybercrimes and explain basic investigation methodologies and evidence preservation procedures.
4. Apply introductory forensic tools and cybersecurity practices for analysing digital evidence and preparing forensic reports.

#### **Unit 1 Computer Fundamentals and Digital Storage (12 Hours)**

Number systems: Binary, Octal, Decimal and Hexadecimal, Conversion and Operations on Binary Number Systems, Representing Information in Hexadecimal and Binary, Logical operations on binary number systems. Computer Architecture: Components of a computer, Input Devices, Central Processing Unit, Primary and secondary Storage Devices, Output Devices. Secondary Storage Devices: Understanding Disk, Volume and Partition, HDD and SSD Structures.

## **Unit 2 Operating Systems and Computer Networks (11 Hours)**

Role of Operating System, Boot Process, Introduction to Process and Memory Management. Windows OS Architecture - FAT and NTFS File Systems. Computer Network: Basic concepts of Computer Network, Open System Interconnection (OSI) and TCP/IP reference model, Protocols and functionalities of each layer, types of connections, networking devices

## **Unit 3 Cybercrime and Digital Forensics (11 Hours)**

Definition of cybercrime, history, classification and types of cybercrimes (spoofing, phishing, vishing, spamming, SMS bombing, stalking, pornography, etc.), virus, worms, ransomware, malware logic/salami attacks, concept of Ponzi scheme, social media platforms and related crimes, forensic investigation of social media crime, cyber terrorism, financial frauds, portals for reporting cybercrimes in India.

## **Unit 4 Cyber security Fundamentals ((11 Hours)**

Introduction to cyber security, Incident Response Management, cyber security, TRIAD (CIA), cyber-attack on cyber security principles, risk assessment, security audit, best security practices, web application security, network application security, Introduction to digital forensic tools (Autopsy, FTK Imager, Wireshark, and Cellebrite—overview only)

## **Practical's (30 Hours)**

1. To perform conversion between binary, decimal, octal, and hexadecimal number systems
2. To study structure of HDD and SSD
3. To perform audio examination using forensic tools
4. To perform identification of different types of cybercrimes
5. To perform basic web/application security testing
6. To perform incident response steps in a simulated case
7. To perform basic network configuration and IP identification

**Assessment Method:** As per university guidelines

## **Suggested Readings:**

1. Hayes, D. R. (2024). *A Practical Guide to Computer Forensics Investigations* (3rd ed.). Pearson.
2. Oettinger, W. (2023). *Learn Computer Forensics* (2nd ed.). Packt.
3. Carvey, H. (2023). *Investigating Windows Systems* (2nd ed.). Syngress/Elsevier.
4. Nelson, B., Phillips, A., & Steuart, C. (2022). *Guide to Computer Forensics and Investigations* (7th ed.). Cengage Learning.
5. Casey, E. (2024). *Digital Evidence and Computer Crime* (4th ed.). Academic Press.
6. Easttom, C. (2022). *Digital Forensics, Investigation, and Response* (4th ed.). Jones & Bartlett Learning.
7. Stallings, W. (2022). *Computer Organization and Architecture* (11th ed.). Pearson.
8. Stallings, W. (2021). *Network Security Essentials: Applications and Standards* (7th ed.). Pearson.
9. Carrier, B. (2005). *File System Forensic Analysis*. Addison-Wesley.
10. Casey, E. (2011). *Handbook of Digital Forensics and Investigation*. Academic Press.

## DSE- 5 HUMAN GENETICS AND MOLECULAR FORENSICS

| Paper                                  | Total Credit | Lecture | Practical/ Practice | Pre-requisite of the course      |
|----------------------------------------|--------------|---------|---------------------|----------------------------------|
| Human Genetics and Molecular Forensics | 04           | 03      | 01                  | Basic knowledge Forensic Science |

### Course Outcomes:

Upon successful completion of this course, students will be able to:

1. Understand the principles of human genetics and molecular biology relevant to forensic science.
2. Explain molecular techniques used for DNA profiling, sequencing, and genetic marker analysis.
3. Apply genetic principles for human identification, kinship analysis, and forensic investigations.
4. Evaluate the scientific, legal, and ethical aspects of forensic DNA evidence.

### Learning Objectives:

After completing this course, students will be able to:

1. Explain the principles of human genetics and molecular forensic analysis.
2. Perform and interpret basic molecular techniques used in forensic DNA analysis.
3. Analyse DNA profiles for human identification, relationship testing, and biological evidence examination.
4. Evaluate the reliability, statistical significance, and legal admissibility of forensic genetic evidence.

### Unit 1 Fundamentals of Human Genetics (12 Hours)

Structure and function of DNA and RNA; Chromosome organization, karyotyping, and chromosomal abnormalities; Mendelian inheritance and extensions (codominance, incomplete dominance, linkage); Population genetics: allele frequency, Hardy-Weinberg equilibrium; Genetic variation in human populations (SNPs, STRs, VNTRs, InDels)

### Unit 2 Molecular Biology Techniques in Forensics (11 Hours)

DNA extraction methods (organic, Chelex, silica-based); DNA quantification techniques (spectrophotometry, real-time PCR); DNA quality assessment and contamination control; Polymerase Chain Reaction (PCR) and its types; Gel electrophoresis and capillary electrophoresis; DNA sequencing methods (Sanger and Next Generation Sequencing)

### Unit 3 DNA Profiling and Human Identification (11 Hours)

Principles of DNA fingerprinting; STR profiling and CODIS markers; Mitochondrial DNA and Y-chromosome analysis; SNP Analysis; Mixed DNA profile interpretation; Statistical

interpretation of DNA Evidence: Random match probability, likelihood ratio, Paternity Index

#### **Unit 4 Advanced Molecular Forensics and Legal Aspects (11 Hours)**

Forensic applications: paternity testing, missing persons, disaster victim identification; DNA databases and their management; Epigenetics and forensic age estimation; Chain of custody and laboratory documentation, Ethical, legal, and social issues in forensic genetics; Quality assurance and accreditation in forensic laboratories.

#### **Practical's (30 Hours)**

1. Restriction digestion of DNA
2. DNA extraction from different forensic biological forensic samples
3. To perform Polymerase chain reaction
4. To perform Agarose gel electrophoresis
5. STR Profiling and report writing using simulated evidences
6. Calculation of Paternity Index and Random Match Probability.
7. Interpretation of DNA sequencing chromatograms or STR electropherograms

**Assessment Method:** As per University Guidelines

#### **Suggested Readings:**

1. Butler, J. M. (2023). *Advanced Topics in Forensic DNA Typing: Methodology* (2nd ed.). Academic Press.
2. Butler, J. M. (2023). *Fundamentals of Forensic DNA Typing* (2nd ed.). Academic Press.
3. Goodwin, W., Linacre, A., & Hadi, S. (2024). *An Introduction to Forensic Genetics* (4th ed.). Wiley-Blackwell.
4. Jobling, M. A., Gill, P., & Hurles, M. (2023). *Human Evolutionary Genetics* (2nd ed.). Garland Science.
5. Primorac, D., & Schanfield, M. (Eds.). (2014). *Forensic DNA Applications: An Interdisciplinary Perspective*. CRC Press. (Classic reference.)
6. Saferstein, R. (2023). *Criminalistics: An Introduction to Forensic Science* (13th ed.). Pearson.
7. Kayser, M., & de Knijff, P. (2011). Improving human forensics through advances in genetics, genomics and molecular biology. *Nature Reviews Genetics*, 12(3), 179–192. (Classic review.)
8. Rapley, R., & Whitehouse, D. (Eds.). (2007). *Molecular Forensics*. Wiley. (Classic reference.)
9. Arenas, M., et al. (2017). Forensic genetics and genomics: Much more than just a human affair. *PLoS Genetics*, 13(9), e1006960.
10. Kowalczyk, M., et al. (2018). Molecular markers used in forensic genetics. *Medicine, Science and the Law*, 58(4), 201–209.

## DSE-6 FORENSIC GENOMICS, PROTEOMICS AND BIOINFORMATICS

| Paper                                            | Total Credit | Lecture | Practical/ Practice | Pre-requisite of the course |
|--------------------------------------------------|--------------|---------|---------------------|-----------------------------|
| Forensic Genomics, Proteomics and Bioinformatics | 04           | 03      | 01                  | Basic knowledge of Biology  |

### Course Outcomes:

Upon successful completion of this course, students will be able to:

1. Understand the principles of genomics, proteomics, and bioinformatics and their applications in forensic science.
2. Explain advanced omics technologies used for human identification and biological evidence characterization.
3. Apply computational tools for biological data analysis and forensic interpretation.
4. Evaluate the scientific, ethical, legal, and societal implications of omics technologies in forensic investigations.

### Learning Objectives:

After completing this course, students will be able to:

1. Explain the principles and applications of genomics, proteomics, and bioinformatics in forensic science.
2. Analyse genomic and proteomic data using appropriate computational tools and biological databases.
3. Interpret omics-based evidence for human identification and forensic investigations.
4. Evaluate the opportunities and limitations of integrated omics approaches in forensic science.

### Unit 1 Forensic Genomics (12 Hours)

Introduction to genomics: structural and functional genomics; Human genome organisation and variation (SNPs, CNVs, STRs); Next Generation Sequencing (NGS) and its forensic applications; Forensic applications of genomics: ancestry inference, phenotyping (hair, eye, skin colour); Epigenomics: DNA methylation in age estimation and tissue identification

### Unit 2 Forensic Proteomics (11 Hours)

Basics of proteomics: protein structure and function; Techniques in proteomics: 2D gel electrophoresis, mass spectrometry (MALDI-TOF, LC-MS/MS); Protein biomarkers in forensic science; Applications: body fluid identification, postmortem interval estimation, hair and fibre analysis, Proteomics in wildlife and species identification

### Unit 3 Bioinformatics in Forensic Science (11 Hours)

Introduction to bioinformatics and biological databases (GenBank, EMBL, DDBJ); Sequence alignment tools (BLAST, ClustalW); Phylogenetic analysis and evolutionary relationships; Forensic DNA databases and data management; Software tools for STR analysis and forensic interpretation

### Unit 4 Integrated Omics and Emerging Trends in Forensic Science (11 Hours)

Multi-omics integration (genomics, proteomics, transcriptomics); Microbiome forensics and its applications; Forensic applications of artificial intelligence and machine learning; Personalized forensics and predictive analysis; Ethical, legal, and privacy concerns in omics data, Future directions in forensic omics

### **Practicals (30 Hours)**

1. Extraction of proteins from biological samples.
2. Estimation of protein concentration using standard biochemical methods.
3. Construction of a Phylogenetic tree from nucleotide and protein sequences
4. To study different protein structures
5. To study the recent advancements in Human Genome Project

**Assessment Method:** As per university guidelines

### **Suggested Readings:**

1. Khan, M. S. (2025). A Comprehensive Overview of Bioinformatics Applications in Forensic Science Related to Omics and Odontology. *THE STETHO*, 6(2), 56-70.
2. Smith, J. H., & Singh, M. (2024). Unlocking Secrets: Bioinformatics' Impact on Forensic Bio-Examinations. *Int. J. Netw. Secur. Its Appl*, 16, 1-15.
3. Muntaha, S. T., Hasnain, M. J. U., Khan, W. A., Rafiq, F., & Pervez, M. T. (2018). Role of bioinformatics in forensic science. *FUUAST Journal of Biology*, 8(1), 133-138.
4. Kopp, P. (2005). Genetics, genomics, proteomics, and bioinformatics. *Clinical Pediatric Endocrinology*, 18-44.
5. Duong, V. A., Park, J. M., Lim, H. J., & Lee, H. (2021). Proteomics in forensic analysis: applications for human samples. *Applied Sciences*, 11(8), 3393.
6. Keane, R. E., Tidy, R. J., Parker, G. J., Gummer, J. P., & Priddis, C. (2024). Mass spectrometry based proteomics: changing the impact of protein analysis in forensic science. *Wiley Interdisciplinary Reviews: Forensic Science*, 6(4), e1516.
7. Mason, K. E., Anex, D., Grey, T., Hart, B., & Parker, G. (2018). Protein-based forensic identification using genetically variant peptides in human bone. *Forensic science international*, 288, 89-96.
8. Baniasad, M., Reed, A. J., Lai, S. M., Zhang, L., Schulte, K. Q., Smith, A. R., ... & Freitas, M. A. (2021). Optimization of proteomics sample preparation for forensic analysis of skin samples. *Journal of proteomics*, 249, 104360.

## **DSE- 7 ADVANCED FORENSIC ANTHROPOLOGY**

| <b>Paper</b>                          | <b>Total Credit</b> | <b>Lecture</b> | <b>Practical/ Practice</b> | <b>Pre-requisite of the course</b> |
|---------------------------------------|---------------------|----------------|----------------------------|------------------------------------|
| <b>Advanced Forensic Anthropology</b> | <b>04</b>           | <b>03</b>      | <b>01</b>                  | Basic knowledge of Biology         |

### **Course Outcomes**

Upon successful completion of this course, students will be able to:

1. Understand advanced concepts of human skeletal biology and their application in forensic anthropology.
2. Apply scientific methods for constructing biological profiles from human skeletal remains.
3. Analyse skeletal trauma, taphonomic changes, and postmortem alterations for medico-legal investigations.
4. Evaluate the role of forensic anthropologists in criminal investigations, disaster victim identification, and humanitarian contexts.

### **Learning Objectives**

After completing this course, students will be able to:

1. Examine and identify human skeletal remains using osteological and anthropometric methods.
2. Estimate sex, age, stature, ancestry, and biological profile from skeletal remains.
3. Interpret skeletal trauma, decomposition, and taphonomic changes in forensic investigations.
4. Apply forensic anthropological methods in crime scene recovery, human identification, and legal proceedings.

### **Unit 1 Human Osteology and Skeletal Biology (12 Hours)**

Detailed study of human skeletal system (axial and appendicular); Bone biology: growth, development, remodeling, and ageing; Skeletal variation and population differences; Metric and non-metric traits in identification; Histological analysis of bone, Human versus non-human skeletal differentiation

### **Unit 2 Biological Profile Estimation (11 Hours)**

Sex determination (morphological and metric methods); Age estimation (subadult and adult skeletal indicators); Stature estimation (long bone measurements, regression formulae); Ancestry estimation and population affinity; Facial reconstruction basics

### **Unit 3 Forensic Taphonomy and Trauma Analysis (11 Hours)**

Taphonomic processes: decomposition, burial, environmental effects; Estimation of postmortem interval (PMI); Types of traumas: blunt force, sharp force, ballistic trauma; Antemortem, perimortem, and postmortem injuries; Mass disasters and commingled remains analysis

### **Unit 4 Forensic Anthropology in Practice and Legal Context (11 Hours)**

Crime scene recovery of skeletal remains; Documentation and chain of custody; Role of forensic

anthropologist in court; Human rights investigations and mass grave analysis; Ethical issues and professional standards.

### **Practicals (30 Hours)**

1. Examination of skeletal remains- long bones- Femur, Humerus.
2. Identification of individuals by long bones and stature estimation
3. Determination of sex and age from Skull with mandible
4. Determination of sex from pelvis and sacrum.
5. Identification of individuals by dental examination
6. Anthropometry - Identification of individuals (in living)

**Assessment Method:** As per university guidelines

### **Suggested Readings:**

1. Pink, C. M., Cornelison, J. B., & Juarez, J. K. (2025). Standardizing Advanced Training in Forensic Anthropology: Defining a Clear Path to Achieve Forensic Specialization in Biological Anthropology. *American Journal of Biological Anthropology*, 186(4), e70055.
2. Franklin, D., & Marks, M. K. (2022). The professional practice of forensic anthropology: Contemporary developments and cross-disciplinary applications. *Wiley Interdisciplinary Reviews: Forensic Science*, 4(2), e1442.
3. Ubelaker, D. H. (2018). Recent advances in forensic anthropology. *Forensic sciences research*, 3(4), 275-277.
4. Christensen, A. M., Passalacqua, N. V., & Bartelink, E. J. (2019). *Forensic anthropology: current methods and practice*. Academic Press.
5. Wescott, D. J. (2018). Recent advances in forensic anthropology: decomposition research. *Forensic sciences research*, 3(4), 278-293.
6. Passalacqua, N. V., Pilloud, M. A., & Congram, D. (2021). Forensic anthropology as a discipline. *Biology*, 10(8), 691.

## **DSE-8 FORENSIC ENGINEERING**

| <b>Paper</b>                | <b>Total Credit</b> | <b>Lecture</b> | <b>Practical/ Practice</b> | <b>Pre-requisite of the course</b>  |
|-----------------------------|---------------------|----------------|----------------------------|-------------------------------------|
| <b>Forensic Engineering</b> | <b>04</b>           | <b>03</b>      | <b>01</b>                  | Basic knowledge of Forensic Science |

### **Course Outcomes:**

Upon successful completion of this course, students will be able to:

1. Understand the principles of engineering science applied to forensic investigations.
2. Explain methods for analysing structural, mechanical, electrical, and material failures.
3. Apply scientific approaches for accident investigation, reconstruction, and interpretation of engineering evidence.
4. Evaluate legal, ethical, and professional aspects of forensic engineering investigations.

### **Learning Objectives**

After completing this course, students will be able to:

1. Explain the principles and methodologies of forensic engineering investigations.
2. Analyse engineering failures using appropriate scientific and technical approaches.
3. Interpret evidence from structural failures, industrial accidents, fires, and traffic collisions.
4. Prepare engineering investigation reports consistent with forensic and legal requirements.

### **Unit 1 Fundamentals of Forensic Engineering (12 Hours)**

Definition, scope, and role of forensic engineering; Basic principles of engineering mechanics (force, stress, strain); Types of engineering failures: structural, mechanical, electrical; Modes of failure: fatigue, corrosion, fracture, overload; principle of failure analysis

### **Unit 2 Structural and Material Failure Analysis (11 Hours)**

Structural failures: buildings, bridges, dams; Material science basics: metals, polymers, composites; Fracture mechanics and crack propagation; Corrosion and environmental degradation; Case studies of engineering failures

### **Unit 3 Accident Investigation and Reconstruction (11 Hours)**

Road traffic accident investigation (vehicle dynamics, skid marks); Fire and explosion investigation basics; Industrial accidents and machinery failure; Electrical accidents and short-circuit analysis; Use of simulation and reconstruction tools

### **Unit 4 Forensic Engineering Practice and Legal Aspects (11 Hours)**

Investigation protocols and documentation; Evidence collection and preservation in engineering cases; Role of expert witness in court; Standards, codes, and safety regulations; Ethics and professional responsibility.

### **Practical's (30 Hours)**

1. Case study on structure collapse and its analysis.
2. To study burn patterns
3. Microscopic examination of fracture surfaces
4. To study skid, scuff, and yaw marks
5. Preparation of a forensic engineering report based on a given case study

**Assessment Method:** As per University Guidelines

### **Suggested Readings:**

1. Petty, S. E. (2021). *Forensic engineering*. CRC Press.
2. Franck, H., & Franck, D. (2013). *Forensic engineering fundamentals*. Boca Raton, FL: CRC Press.
3. Noon, R. K. (2020). *Introduction to forensic engineering*. CRC Press.
4. Liptai, L. L. (2009). Forensic engineering and the scientific method. *Journal of the National Academy of Forensic Engineers*, 26(1).
5. Batterman, S. C., & Batterman, S. D. (2002). Forensic engineering. *McGraw-Hill Yearbook of Science & Technology*, McGraw-Hill.
6. Brown, S. (2007). Forensic engineering: Reduction of risk and improving technology (for all things great and small). *Engineering Failure Analysis*, 14(6), 1019-1037.
7. Breysse, D. (2012). Forensic engineering and collapse databases. *Proceedings of the Institution of Civil Engineers-Forensic Engineering*, 165(2), 63-75.

## **DSE- 9 ADVANCED TECHNIQUES IN CRIME SCENE INVESTIGATION**

| <b>Paper</b>                                            | <b>Total Credit</b> | <b>Lecture</b> | <b>Practical/ Practice</b> | <b>Pre-requisite of the course</b> |
|---------------------------------------------------------|---------------------|----------------|----------------------------|------------------------------------|
| <b>Advanced Techniques in Crime Scene Investigation</b> | <b>04</b>           | <b>03</b>      | <b>01</b>                  | Basic knowledge Forensic Science   |

### **Course Outcomes:**

1. To impart advanced knowledge of scientific crime scene investigation techniques.
2. To familiarize students with modern technologies used in crime scene documentation, evidence recognition, collection, preservation, and reconstruction.
3. To develop analytical skills for interpreting crime scene evidence using contemporary forensic methods.
4. To acquaint students with international standards, quality assurance, and legal aspects of crime scene investigation.

### **Learning Objectives:**

1. Demonstrate proficiency in advanced crime scene management and evidence handling.
2. Apply modern imaging, mapping, and documentation technologies at crime scenes.
3. Analyze and reconstruct crime scenes using scientific principles and forensic evidence.
4. Evaluate complex crime scenes involving homicide, explosions, disasters, and environmental crimes.

### **Unit 1: Advanced Crime Scene Management (12 Hours)**

Evolution and scope of crime scene investigation, classification and types of crime scenes, responsibilities of crime scene investigators, crime scene security and preservation, establishment of crime scene perimeters, systematic search methods, scene assessment and risk management, primary and secondary crime scene surveys, documentation of crime scenes through notes, photography, videography, sketching and digital recording, chain of custody, evidence integrity, standard operating procedures for crime scene investigation, Health, safety, and personal protective equipment (PPE) at crime scenes

### **Unit 2: Modern Crime Scene Documentation and Evidence Detection (11 Hours)**

Advanced forensic photography, videography and panoramic imaging, drone-assisted crime scene documentation, photogrammetry, terrestrial laser scanning (LiDAR), three-dimensional crime scene reconstruction, Total Station Surveying, Geographic Information System (GIS) applications, alternate light sources (ALS), ultraviolet, infrared and fluorescence imaging, multispectral and

hyperspectral imaging, detection and enhancement of latent biological evidence, chemical enhancement techniques, mobile crime scene documentation technologies.

### **Unit 3: Crime Scene Reconstruction and Interpretation (11 Hours)**

Principles of crime scene reconstruction, bloodstain pattern analysis, shooting incident reconstruction, trajectory analysis, traffic accident reconstruction, fire and explosion scene reconstruction, interpretation of footwear and tyre impressions, tool mark evidence, trace evidence reconstruction, sequence of events reconstruction, behavioral crime scene analysis, disaster and mass fatality scene management, interpretation of forensic findings through case studies.

### **Unit 4: Emerging Technologies in Crime Scene Investigation (11 Hours)**

Application of artificial intelligence and machine learning in crime scene investigation, virtual reality and augmented reality in crime scene reconstruction, Internet of Things (IoT) evidence, wearable devices and smart surveillance systems, cyber-enabled crime scene investigation, mobile forensic evidence at crime scenes, underwater crime scene investigation, cold case review using advanced forensic technologies, international standards for crime scene investigation recent advances and future perspectives in crime scene investigation.

### **Practical's (30 Hours)**

1. Crime scene documentation using field notes, photography, videography, and crime scene sketching.
2. Documentation of crime scenes using photogrammetry software.
3. Demonstration of 3D laser scanner/Total Station for crime scene mapping.
4. Detection and enhancement of latent bloodstains using chemical reagents
5. Recovery and casting of footwear and tyre impressions.
6. Bloodstain Pattern Analysis (BPA) at simulated crime scenes.
7. Crime scene mapping using Geographic Information System (GIS) applications.
8. Digital crime scene reconstruction using Virtual Reality (VR) or other reconstruction software

**Assessment Method:** As per university guidelines

### **Suggested Readings:**

1. Fisher, B. A. J., & Fisher, D. R. (2022). *Techniques of Crime Scene Investigation* (9th ed.). CRC Press.
2. Gardner, R. M., & Bevel, T. (2021). *Practical Crime Scene Processing and Investigation* (3rd ed.). CRC Press.
3. Lee, H. C., Palmbach, T., & Miller, M. T. (2022). *Henry Lee's Crime Scene Handbook* (Revised ed.). Academic Press.
4. Saferstein, R. (2023). *Criminalistics: An Introduction to Forensic Science* (13th ed.). Pearson.
5. Houck, M. M., & Siegel, J. A. (2015). *Fundamentals of Forensic Science* (3rd ed.). Academic Press.
6. Chisum, W. J., & Turvey, B. E. (2011). *Crime Reconstruction* (2nd ed.). Academic Press. (*Classic reference.*)
7. Bevel, T., & Gardner, R. M. (2021). *Bloodstain Pattern Analysis* (4th ed.). CRC Press.

## DSE- 10 DISASTER VICTIM IDENTIFICATION

| Paper                          | Total Credit | Lecture | Practical/ Practice | Pre-requisite of the course         |
|--------------------------------|--------------|---------|---------------------|-------------------------------------|
| Disaster Victim Identification | 04           | 04      | 00                  | Basic knowledge of Forensic Science |

### Course Outcomes:

1. To provide students basic conceptual understanding about disasters and Disaster management
2. To make students learn about the importance of the key aspect of Disaster victim identification
3. To Enhance the skill of the student's investigative procedure in mass fatality

### Learning Objectives:

The students will gain knowledge of

1. Disaster Management Techniques and their application in Disaster Management.
2. Fundamentals of DVI and its application in Scene Processing and Recovery of evidences.
3. Humanitarian Approach in Disaster Management.

### Unit 1 Disaster Management and Fundamentals of Disaster Victim Identification (16 Hours)

Introduction to disasters, Classification and Types of disasters, National and Global Impact of Disasters; Causes, Effects and Practical examples for all disasters.

Disaster Management Techniques: Risk and Vulnerability Analysis, its concept and Reduction, Early and Advance Warning Systems, understanding climate risk, Mapping of risk assessment, Decision making for risk reduction, Problems in risk assessment, Geographical Information System (GIS).

### Unit 2 Scene Processing and Recovery Operations (15 Hours)

Disaster preparedness and Response: Overview and Understanding of Disaster Preparedness, Early Warnings and Safety Measures of Disaster, Resource Management- Financial, Medical, equipment, communication, Human, transportation, Food and essential commodity, Directing and controlling functions, Role of Government, International and NGO Bodies.

Fundamentals of DVI: Principle and Guideline of DVI, Different expertise and equipment's, Composition of Investigation team (DVI team), Health and personnel safety.

### Unit 3 Scientific Methods of Victim Identification (15 Hours)

Scene Processing and Recovery: Process of DVI operation on site and Mortuary, Handling and preservation of Human and non-human remains, Documentation, Body labelling, Disaster photography/videography and their kits, Different types of coordination centre.

Investigative Process: Establishing Identifiers, Biological Profiling of Primary and Secondary Identifiers (Fingerprint, Teeth and DNA), Advance Techniques (Radiology, Scanners, 3D printers),

Different AM data collection and documentation, Different type of PM examination and Documentation, Digital data maintenance software, Reconciliation and Repatriation.

#### **Unit 4 Humanitarian, Ethical and Legal Aspects of DVI (14 Hours)**

Humanitarian Approach: Concept and Nature of ethics; Role and purpose of ethics; ethical norms and principles; International Humanitarian Law; Disaster Policy: The International Decade for Natural Disaster Reduction, Disaster Policy (National Policy on Disaster Management), Disaster Management Act 2005. National Disaster Management Plan, Role of Media and its importance, role of Fire Services, Para-military, Armed forces, presently challenging aspect of disaster management in India.

**Assessment Method:** As per University Guidelines

#### **Suggested Readings:**

1. James, J. P., Nordby, J. J., & Bell, S. (2025). *Forensic Science: An Introduction to Scientific and Investigative Techniques* (6th ed.). CRC Press.
2. Houck, M. M., & Siegel, J. A. (2015). *Fundamentals of Forensic Science* (3rd ed.). Academic Press.
3. Blau, S., & Ubelaker, D. H. (Eds.). (2016). *Handbook of Forensic Anthropology and Archaeology*. Routledge.
4. Prahlow, J. A. (2024). *Forensic Pathology for Police, Death Investigators, Attorneys and Forensic Scientists* (2nd ed.). Humana Press.
5. Murthy, D. B. N. (2012). *Disaster Management*. Deep & Deep Publications.
6. Staggs, S. (2005). *Crime Scene and Evidence Photographer's Guide*. Staggs Publishing. (Useful for disaster documentation.)
7. Patnaik, S.M. (2023). Community Participation Strategies in Nepal's Disaster Management. In: Singh, A. (eds) International Handbook of Disaster Research. Springer, Singapore. [https://doi.org/10.1007/978-981-19-8388-7\\_112](https://doi.org/10.1007/978-981-19-8388-7_112)

### GE-3 FUNDAMENTALS OF IMMUNOLOGICAL TECHNIQUES IN FORENSIC SCIENCE

| Paper                                                        | Total Credit | Lecture | Practical/ Practice | Pre-requisite of the course |
|--------------------------------------------------------------|--------------|---------|---------------------|-----------------------------|
| Fundamentals of Immunological Techniques in Forensic Science | 04           | 03      | 01                  | Basic knowledge of Biology  |

#### Course Outcomes:

Upon successful completion of this course, students will be able to:

1. Understand the basic concepts of the immune system and antigen–antibody interactions.
2. Explain immunological techniques commonly used in forensic and diagnostic investigations.
3. Apply serological methods for the identification and analysis of biological evidence.
4. Evaluate the significance and limitations of immunological techniques in forensic science.

#### Learning Objectives:

After completing this course, students will be able to:

1. Explain the structure and functions of the immune system and immunological components.
2. Interpret antigen–antibody reactions and common serological tests.
3. Apply immunological techniques in the examination of forensic biological evidence.
4. Assess the reliability and medico-legal significance of immunological findings.

#### Unit 1 Basics of the Immune System (12 Hours)

Overview of immunity: innate and adaptive immunity; Cells of the immune system: lymphocytes, macrophages, dendritic cells, NK cells; Organs of the immune system: primary and secondary lymphoid organs; Antigens and immunogens: properties and types; Cytokines and their functions

#### Unit 2 Antibodies and Antigen–Antibody Reactions (11 Hours)

Structure and classes of immunoglobulins (IgG, IgM, IgA, IgE, IgD); Antigen–antibody interactions: specificity, affinity, avidity; Principles of serological reactions: precipitation, agglutination; Complement system and its pathways; Hypersensitivity reactions (Types I–IV)

#### Unit 3 Immunological Techniques in Forensic Science (11 Hours)

Blood group antigens and typing (ABO, Rh system); Serological methods: ELISA, RIA, immunodiffusion, immunoelectrophoresis; Immunoassays for detection of drugs, toxins, and biological fluids; Monoclonal antibodies and their applications; Use of immunology in species identification and paternity testing

#### **Unit 4 Advanced Immunology and Clinical Relevance (11 Hours)**

Major Histocompatibility Complex (MHC) and antigen presentation; Immune response regulation and tolerance; Autoimmune diseases and immunodeficiency disorders; Vaccines and immunization principles; Ethical and legal considerations in immunological testing.

#### **Practical's (30 hours)**

1. Determination of blood group using Antisera
2. To Determine the Rh factor of given blood sample
3. To perform presumptive tests for blood
4. To perform presumptive tests for saliva
5. To differentiate between Human and animal blood using precipitin test
6. Demonstration of ELISA (Enzyme-Linked Immunosorbent Assay)

**Assessment Method:** As per university guidelines

#### **Suggested Readings:**

1. Bier, O. G., Da Silva, W. D., Götze, D., & Mota, I. (2012). *Fundamentals of immunology*. Springer Science & Business Media.
2. Ansell, S. M. (2020). Fundamentals of immunology for understanding immunotherapy for lymphoma. *Hematology 2014, the American Society of Hematology Education Program Book, 2020(1)*, 585-589.
3. Woods, M. E. (2017). Fundamentals of immunology and inflammation. In *Nanomedicine for Inflammatory Diseases* (pp. 3-38). CRC Press.
4. Aruljothi, B., Mangala, K. J., Swain, M. P., & Sukhramani, P. S. (2023). *Basics And Fundamentals Of Immunology*. Academic Guru Publishing House.
5. Mir, M. A. (Ed.). (2020). *Basics and Fundamentals of Immunology*. Nova Medicine & Health.
6. Delves, P. J., Martin, S. J., Burton, D. R., & Roitt, I. M. (2017). *Roitt's essential immunology*. John Wiley & Sons.
7. Novotny, A. M. (2014). *Fundamentals of Immunology*.

## GE-4 FUNDAMENTALS OF AI AND MACHINE LEARNING IN FORENSIC SCIENCE

| Paper                                                       | Total Credit | Lecture | Practical/ Practice | Pre-requisite of the course  |
|-------------------------------------------------------------|--------------|---------|---------------------|------------------------------|
| Fundamentals of AI and Machine Learning in Forensic Science | 04           | 03      | 01                  | Basic knowledge of Computers |

### Course Outcomes:

Upon successful completion of this course, students will be able to:

1. Understand the fundamental concepts of artificial intelligence, machine learning, and data science relevant to forensic science.
2. Explain methods of data preparation, feature engineering, and predictive modelling.
3. Apply basic machine learning techniques to analyse forensic datasets and solve investigative problems.
4. Evaluate the ethical, legal, and practical implications of AI-based forensic applications.

### Learning Objectives:

After completing this course, students will be able to:

1. Explain the principles of artificial intelligence, machine learning, and data analytics.
2. Prepare and preprocess forensic datasets for machine learning applications.
3. Apply supervised and unsupervised learning algorithms to forensic problems.
4. Interpret machine learning results and assess their reliability, limitations, and ethical implications.

### Unit 1 Foundations of Data Science and Machine Learning (12 Hours)

Overview of Data Science: need, components, and applications; Data Science lifecycle: data collection, processing, analysis, interpretation; Introduction to Machine Learning: human vs. machine learning; Learning problem and hypothesis space; Types of Machine Learning: supervised, unsupervised, reinforcement learning; Applications of ML in forensic science (crime prediction, pattern recognition, biometrics); Issues in Machine Learning: bias, overfitting, data limitations; Tools and platforms for ML (Python, R, basic libraries)

### Unit 2 Data Preparation and Feature Engineering (11 Hours)

Types of data in machine learning (structured, unstructured, categorical, numerical); Exploring data structure and datasets; Data quality issues and remediation (missing data, noise, inconsistencies); Data preprocessing: cleaning, normalization, transformation; Basics of Feature Engineering: concept and importance; Feature transformation: construction, extraction; Feature selection and dimensionality reduction

### **Unit 3 Supervised and Unsupervised Learning (11 Hours)**

Supervised learning: classification and regression concepts; Classification models and workflow; Algorithms: k-Nearest Neighbour (k-NN), Decision Tree, Random Forest, Support Vector Machine (SVM); Regression models: Simple Linear Regression, Multiple Linear Regression, Logistic Regression; Unsupervised learning: concepts and applications; Clustering techniques and association rule mining; Comparison: supervised vs. unsupervised learning

### **Unit 4 Neural Networks, Modelling and Forensic Applications (11 Hours)**

Model building process: selecting, training, and testing models; Model representation and evaluation metrics (accuracy, precision, recall); Artificial Neural Networks (ANN): Biological vs artificial neuron, Activation functions, Network architecture; Learning process in ANN and backpropagation algorithm; Introduction to Deep Learning; AI applications in forensic science: Face recognition and biometrics, Crime pattern analysis, Digital forensics and fraud detection; Ethical and legal considerations in AI-based forensic analysis

### **Practical's (30 Hours)**

1. Loading and exploration of datasets
2. Basic statistical analysis and visualization of forensic datasets.
3. Data cleaning and preprocessing
4. Linear and logistic regression using forensic datasets
5. K-Means clustering.
6. Crime data analysis using real or simulated datasets.
7. Classification using Decision Tree or Random Forest.
8. Basic AI workflow using WEKA or Orange Data Mining.

**Assessment Method:** As per University Guidelines

### **Suggested Readings:**

1. Müller, A. C., & Guido, S. (2022). *Introduction to Machine Learning with Python* (2nd ed.). O'Reilly.
2. Géron, A. (2023). *Hands-On Machine Learning with Scikit-Learn, Keras & TensorFlow* (3rd ed.). O'Reilly.
3. Alpaydin, E. (2021). *Introduction to Machine Learning* (4th ed.). MIT Press.
4. Russell, S., & Norvig, P. (2021). *Artificial Intelligence: A Modern Approach* (4th ed.). Pearson.
5. Datt, S., Chandramouli, S., & Das, A. *Machine Learning*. Pearson.
6. Saferstein, R. (2023). *Criminalistics: An Introduction to Forensic Science* (13th ed.). Pearson.
7. James, S. H., Nordby, J. J., & Bell, S. (2025). *Forensic Science: An Introduction to Scientific and Investigative Techniques* (6th ed.). CRC Press.
8. Goodfellow, I., Bengio, Y., & Courville, A. (2016). *Deep Learning*. MIT Press.

## Skill Enhancement Course

### SEC-1 OPTICAL TECHNIQUES WITH LABORATORY TRAINING

| Paper                                       | Total Credit | Theory | Practical/ Practice | Pre-requisite of the course         |
|---------------------------------------------|--------------|--------|---------------------|-------------------------------------|
| Optical Techniques with Laboratory training | 02           | 01     | 01                  | Basic knowledge of Forensic Science |

#### Course Outcomes:

1. To understand laboratory practices, safety protocols, and quality assurance procedures associated with optical techniques in forensic science.
2. To develop practical skills in the operation, maintenance, and documentation of optical instruments used for forensic examinations.
3. To acquire competence in digital imaging, evidence documentation, and interpretation of microscopic observations.
4. To familiarize students with recent advancements and emerging optical technologies used in forensic laboratories.

#### Learning Objectives:

After successful completion of the course, students will be able to:

1. Demonstrate safe laboratory practices and apply quality assurance measures during forensic optical examinations.
2. Operate, maintain, and select appropriate optical instruments for the examination of different types of forensic evidence.
3. Acquire, document, interpret, and report optical observations using digital imaging and microscopy techniques.
4. Evaluate the applications and limitations of contemporary and emerging optical technologies in forensic science.

#### Theory

##### Unit I: Laboratory Practices and Optical Instrumentation (8 Hours)

Role of optical techniques in forensic laboratories; Laboratory organization and workflow; Selection of appropriate optical instruments for different types of evidence; Instrument calibration, validation and preventive maintenance; Standard Operating Procedures (SOPs); Laboratory safety and biosafety practices; Quality assurance and quality control (QA/QC); Good Laboratory Practices (GLP); Chain of custody, evidence handling, packaging and preservation during optical examination; Documentation and report writing.

##### Unit II: Digital Imaging, Data Interpretation and Emerging Optical Technologies (7 Hours)

Digital microscopy and image acquisition; Image enhancement, measurement and annotation; Photomicrography and forensic photography; Interpretation and limitations of optical observations; Sources of

error and quality control in microscopic examinations; Laboratory Information Management Systems (LIMS) in microscopy laboratories; Recent advances in forensic optical technologies including automated image analysis, AI-assisted microscopy, hyperspectral imaging, confocal microscopy and 3D digital microscopy; Case studies demonstrating the role of optical techniques in forensic investigations.

### **Practical's (30 Hours)**

1. Laboratory safety, handling, and maintenance of optical instruments.
2. Examination of biological specimens under a compound microscope.
3. Identification of textile fibers using a comparison microscope.
4. Examination of hair samples for species and individual characteristics.
5. Polarized Light Microscopy (PLM) for identification of fibres and crystalline substances.
6. Stereo microscope examination of trace evidence (glass, paint, soil, pollen, and fibres).
7. Examination of questioned documents using a Stereo Zoom Microscope.
8. Digital image capture and documentation using microscope imaging systems.
9. Demonstration of Fluorescence Spectroscopy.
10. Examination of biological stains under Alternate Light Source
11. ALS Examination of security features in currency notes under UV light.
12. Optical examination of latent fingerprints using Alternate Light Source.
13. Identification of counterfeit pharmaceutical packaging using optical techniques.
14. Microscopic examination of pollen and diatoms.

**Assessment Method:** Internal Assessment, End term Practical Examination

### **Suggested Readings**

1. Skoog, D.A., West, D.M., Holler, F.J., and Crouch, S.R. Fundamentals of Analytical Chemistry. 9th Edition. Cengage Learning.
2. Saferstein, R. Criminalistics: An Introduction to Forensic Science. 12th Edition. Pearson Education.
3. Houck, M.M., and Siegel, J.A. Fundamentals of Forensic Science. 4th Edition. Academic Press.
4. Hilton, O. Scientific Examination of Questioned Documents. CRC Press.
5. Osborn, A.S. Questioned Documents. Lawyers & Judges Publishing Company.
6. Sharma, B.R. Forensic Science in Criminal Investigation and Trials. Universal Law Publishing.
7. Directorate of Forensic Science Services (DFSS), Government of India. Laboratory Manuals and Standard Operating Procedures.

## SEC-2 SEPARATION TECHNIQUES WITH LABORATORY TRAINING

| Paper                                          | Total Credit | Theory | Practical/ Practice | Pre-requisite of the course  |
|------------------------------------------------|--------------|--------|---------------------|------------------------------|
| Separation techniques with laboratory training | 02           | 01     | 01                  | Basic knowledge of chemistry |

### Course Outcomes

After completion of this course, the learners will be able to:

1. To understand laboratory practices and quality assurance associated with separation techniques.
2. To develop practical skills in sample preparation and the operation of separation techniques used in forensic and analytical laboratories.
3. To acquire competency in documentation, interpretation, and reporting of laboratory results.
4. To familiarize students with recent advances and applications of separation technologies in forensic science.

### Learning Objectives

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

1. Demonstrate safe laboratory practices and apply quality assurance measures while performing separation techniques.
2. Select appropriate sample preparation and separation methods for different types of forensic and analytical samples.
3. Record, interpret, and report analytical findings generated through separation techniques.
4. Evaluate the applications, limitations, and recent developments in separation technologies used in forensic laboratories.

### Unit I: Laboratory Practices and Quality Assurance in Separation Techniques (8 Hours)

Role of separation techniques in forensic and analytical laboratories; Sample collection, preservation, storage, and preparation for analysis; Selection of appropriate separation methods based on sample characteristics; Standard Operating Procedures (SOPs); Good Laboratory Practices (GLP); Laboratory safety and chemical handling; Instrument calibration, validation, and routine maintenance; Quality assurance and quality control (QA/QC); Chain of custody, documentation, and laboratory record management.

### Unit II: Data Interpretation and Emerging Trends in Separation Science (7 Hours)

Interpretation of chromatograms, electropherograms, and separation profiles; Sources of analytical error and troubleshooting; Validation parameters for separation methods (accuracy, precision, sensitivity, selectivity, reproducibility); Digital data acquisition and laboratory information management systems (LIMS); Applications of separation techniques in forensic, environmental, pharmaceutical, and biomedical sciences; Recent advances including hyphenated techniques (GC-MS, LC-MS/MS), automated sample preparation,

microfluidic separation systems, green analytical chemistry, and AI-assisted data interpretation.

### **Practical's (30 Hours)**

1. Determination of extraction efficiency using solvent extraction.
2. Separation of pigments by liquid-liquid extraction.
3. Solid-Liquid Extraction (Soxhlet extraction).
4. Solid Phase Extraction (SPE) of drug samples.
5. Isolation of caffeine from tea/coffee samples.
6. Separation of metallic ions by paper chromatography
7. Separation of plant pigments (chlorophylls and carotenoids) from green leaves by chromatography.
8. Demonstration of Gas Chromatography (GC).
9. Demonstration of High-Performance Liquid Chromatography (GC).
10. Determination of ion exchange capacity of a given cation or anion exchanger
11. Determination of the residual chlorine in city water supply using colorimetry

**Assessment Method:** As per University Guidelines

### **Suggested Readings**

1. J. M. Miller. Chromatography Concepts and Contrasts, Wiley, 2004
2. R. W. Rousseau, Handbook of Separation Process Technology, Wiley, 1987.
3. M. K. Purkait, R. Singh, Membrane Technology in Separation Science, CRC Press, 2018.
4. Separation Process Principles, J.D. Seader and E.J. Henley, Wiley, 2nd Edition 2004
5. Transport Processes and Separation Process principles, Christie J Geankoplis Prentice-Hall of India Private Ltd, New Delhi, 4th Edition 2006

### SEC-3 Foundations of Research Design

| Paper                          | Total Credit | Theory | Practical/ Practice | Pre-requisite of the course                        |
|--------------------------------|--------------|--------|---------------------|----------------------------------------------------|
| Foundations of Research Design | 02           | 01     | 01                  | Basic knowledge of Forensic Science and Statistics |

#### Course Outcomes

After completion of this course, the learners will be able to:

1. Understand the principles and components of research design in scientific investigations.
2. Develop competence in qualitative, quantitative, and mixed-method research approaches.
3. Apply appropriate methods for data collection, sampling, analysis, and interpretation.
4. Recognize ethical principles and good research practices in scientific research.

#### Learning Objectives

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

1. Formulate research problems, objectives, hypotheses, and appropriate research designs.
2. Select suitable sampling strategies and data collection methods for different research problems.
3. Apply qualitative and quantitative approaches for data analysis and interpretation.
4. Demonstrate ethical conduct and scientific integrity throughout the research process.

#### Unit I: Foundations of Research Design (8 Hours)

Meaning, purpose and significance of research design; Characteristics of a good research design; Types of research design—exploratory, descriptive, analytical, experimental, cross-sectional, longitudinal, case study and mixed-methods design; Formulation of research problem, research questions, objectives and hypotheses; Variables and their types; Sampling methods and sample size considerations; Reliability, validity and ethical considerations in research design.

#### Unit II: Data Collection, Analysis and Scientific Communication (7 Hours)

Methods of data collection—observation, interview, questionnaire, schedule and laboratory records; Qualitative and quantitative data; Data coding, tabulation and graphical presentation; Introduction to statistical software and reference management tools; Interpretation of results; Structure of scientific reports and research papers; Referencing and citation styles; Plagiarism, research integrity and responsible use of Artificial Intelligence in research.

#### Practical (30 Hours)

1. Identification and formulation of a research problem and preparation of research objectives.
2. Preparation of a research proposal including hypothesis and research design.
3. Designing questionnaires, interview schedules and observation checklists.
4. Selection of sampling methods and determination of sample size using case studies.
5. Collection of primary data through surveys/interviews and preparation of field records.
6. Data coding and preparation of data sheets using spreadsheet software.
7. Tabulation and graphical presentation of data.
8. Descriptive statistical analysis using MS Excel/SPSS/R (mean, median, standard deviation, charts).
9. Reference management using Mendeley/Zotero and preparation of bibliography.

10. Identification of plagiarism using plagiarism detection software and preparation of similarity reports.
11. Preparation of scientific posters and oral presentations.
12. Writing a mini research report following standard scientific format.
13. Ethical review of selected research case studies.
14. Presentation and viva voce of the mini research project.

**Assessment Method:** As per University guidelines

### **Suggested Readings**

1. Kothari, C.R., & Garg, G. *Research Methodology: Methods and Techniques*. 4th Edition. New Age International Publishers.
2. Creswell, J.W., & Creswell, J.D. *Research Design: Qualitative, Quantitative, and Mixed Methods Approaches*. 6th Edition. SAGE Publications.
3. Kumar, R. *Research Methodology: A Step-by-Step Guide for Beginners*. 5th Edition. SAGE Publications.
4. Bernard, H.R. *Research Methods in Anthropology: Qualitative and Quantitative Approaches*. 6th Edition. Rowman & Littlefield.
5. Neuman, W.L. *Social Research Methods: Qualitative and Quantitative Approaches*. 8th Edition. Pearson.
6. American Psychological Association. *Publication Manual of the American Psychological Association*. 7th Edition. APA.
7. Booth, W.C., Colomb, G.G., Williams, J.M., Bizup, J., & Fitzgerald, W.T. *The Craft of Research*. 5th Edition. University of Chicago Press.
8. Singh, Y.K. *Fundamental of Research Methodology and Statistics*. New Age International Publishers.

## **SEM-IV**

## DSC-9 INSTRUMENTAL TECHNIQUES IN FORENSIC ANALYSIS - II

| Paper                                           | Total Credit | Lecture | Practical/ Practice | Pre-requisite of the course             |
|-------------------------------------------------|--------------|---------|---------------------|-----------------------------------------|
| Instrumental Techniques in Forensic Analysis II | 04           | 03      | 01                  | Basic understanding of forensic science |

### Course Outcomes:

1. To understand basic principles of modern analytical instruments
2. To learn applications of microscopy and spectroscopy in forensics
3. To develop knowledge of material analysis techniques
4. To apply instrumental methods in forensic investigations

### Learning Objectives:

Students will be able to:

1. Explain working principles of major forensic instruments
2. Identify appropriate techniques for different types of evidence
3. Interpret analytical results in forensic context
4. Apply instrumental methods in laboratory-based investigations

### Unit 1 Introduction to Microscopy (12 Hours)

Introduction, theory, principles, sample preparation, and applications of electron microscope including Scanning Electron Microscope, Field Emission Scanning Electron Microscope, Transmission Electron Microscope, Energy Dispersive X Ray, Scanning Probe Microscope, Scanning, Tunnelling Electron Microscope (STEM), Atomic Force Microscope, Quantum 3D Microscope, and Confocal Microscopy, Polarizing Microscopy.

### Unit 2 Atomic Spectroscopy (11 Hours)

Introduction, theory, principles, sample preparation, and applications of Atomic Absorption Spectroscopy, Graphite Furnace Atomic Absorption Spectroscopy, Atomic Emission Spectroscopy, Inductively Coupled Plasma Atomic Emission Spectroscopy, Inductively Coupled Plasma Mass Spectroscopy.

### Unit 3 X-Ray Techniques (11 Hours)

Introduction, theory, principles, sample preparation, and applications of X Ray Diffraction, X Ray Fluorescence (Energy and Wavelength Dispersion), Auger Electron Spectroscopy (ESCA)

#### **Unit 4 Thermal Techniques (11 Hours)**

Introduction, theory, principles, sample preparation, and applications of Nuclear Magnetic Resonance Spectroscopy, Neutron Activation Analysis, Thermo Gravimetric Analysis, Differential Thermal Analysis. Glass Refractive Index Measurement (GRIM), Densitometer, Universal Tensile Strength testing equipment (UTM), Immunoassay and Centrifugation techniques.

#### **Practical's (30 Hours)**

1. To analyses various physical evidences using microscopes
2. To perform centrifugation of biological samples.
3. To analyses the given sample by using Mass Spectroscopy.
4. To calculate refractive index of glass by using Refractometer.
5. To analyses the given sample by using XRD and XRF
6. To understand Instrumentation and application of Raman Spectroscopy

**Assessment Method:** As per university guidelines

#### **Suggested Readings:**

1. Robinson J.W, Frame E.M.K and Frame II G.M (2005); Undergraduate Instrumental Analysis. M. Dekker.
2. Skoog D.A, Holler F.J & Crouch S.R (2021); Principles of Instrumental analysis: Cengage Learning Inc.
3. Merrit W and Settle D (1981); Instrumental Methods of Analysis. Van Nostrand.
4. Saferstein R (2015); Criminalistics An introduction to Forensic Science, Pearson.
5. Pavia D.L, Lapman G.L, Kriz G.S and Vyvyan J.R(2015); Introduction to Spectroscopy. Cengage Learning.
6. Chapmen J.R (1993); Practical Organic Mass Spectrometry- A Guide for Chemical and Biochemical Analysis. Wiley & Sons.
7. Chatwal, G.R and Anand S.K. (1984); Instrumental Methods Of Chemical Analysis. Himalaya Publishing House.

## DSC-10 QUESTIONED DOCUMENTS AND MULTIMEDIA FORENSICS

| Paper                                         | Total Credit | Lecture | Practical/ Practice | Pre-requisite of the course         |
|-----------------------------------------------|--------------|---------|---------------------|-------------------------------------|
| Questioned Documents and Multimedia Forensics | 04           | 03      | 01                  | Basic Knowledge of Forensic Science |

### Course Outcomes:

After studying this course, the student will learn to

1. Identify the questioned document at the crime scene.
2. Examine the questioned document using different basic tools.
3. Compare various handwriting and signature samples.
4. Detect frauds and forgeries by analyzing questioned documents.

### Learning Objectives:

1. To explain the nature and scope of questioned documents, including types, characteristics, and the principles of handwriting analysis.
2. To identify various types of document forgeries and alterations and assess their impact.
3. To evaluate handwriting and signature development, document features to determine authenticity.
4. To synthesize findings from document and handwriting analyses to produce comprehensive forensic reports

### Unit 1: Introduction to Questioned Documents (12 Hours)

Nature and Scope of Questioned Documents, definition of questioned documents. Types of Document / Classification of documents, Handling and packing of documents, Procurements of standards- admitted / specimen writings. Preliminary examination of documents. Sections related to Questioned Document Examinations.

### Unit 2: Handwriting and Signature Examination (11 Hours)

Principles of hand writing & signature identification. Class and Individual Characteristics of Handwriting. Disguise writings, Natural Variations. Basic tools needed for forensic documents' examination ultraviolet, visible, infrared and fluorescence spectroscopy, photography of questioned documents, visible spectral comparator, electrostatic detection apparatus.

### Unit 3: Document Forgery and Security Documents (11 Hours)

Forgeries & its types and their detections, Examination of alterations, erasers, overwriting, addition and obliterations, Examination of counterfeit currency notes, passport, credit card, visa, seal and other mechanical impressions. Use of digital technology in the perpetration of white-collar crimes and their detection, digitally manipulated and machine generated documents- their nature, examination and reporting as well as evidence impact.

#### **Unit 4: Multimedia Forensics and Advanced Document Examination (11 Hours)**

Determination of sequence of strokes, age of document, Physical matching of Documents  
Printing Devices- impact and non- impact printing, Examination of modern printing techniques,  
Decipherment of secret & indented writings, ESDA and Examination of charred documents,  
Examination of typescripts, Xerox- Analog and Digital, computer printouts

#### **Practical's (30 Hours)**

1. Identification of Handwriting-general characteristics, natural variations, fundamental divergences and individual characteristics
2. To detect Simulated and traced forgeries
3. Examination of additions, erasures, and obliterations in the documents.
4. Examination of writing inks by TLC/ Paper chromatography.
5. To examine the security features of currency notes, passport, cheques etc.
6. To decipher secret writing.

**Assessment Method:** As per University Guidelines

#### **Suggested Readings:**

1. Albert S. Osborn; Questioned Documents, Second Ed.; Universal Law Publishing, Delhi
2. O. Hilton, *Scientific Examination of Questioned Documents*, CRC Press, Boca Raton  
Crime in India Reports (Annual) by the National Crime Records Bureau (NCRB)
3. R.N. Morris, Forensic Handwriting Identification: Fundamental Concepts and Principles, Academic Press, London.
4. E. David, The Scientific Examination of Documents—Methods and Techniques, 2<sup>nd</sup> Edition, Taylor & Francis, Hants.
5. Wilson R. Harrison; Suspect Documents -Their Scientific Examination; Universal Law Publishing, Delhi- please see publisher
6. Heidi H Harralson: Huber and Headrick's Handwriting Identification

## DSE-11 FORENSIC TOXICOLOGY AND PHARMACOLOGY

| Paper                                | Total Credit | Lecture | Practical/ Practice | Pre-requisite of the course       |
|--------------------------------------|--------------|---------|---------------------|-----------------------------------|
| Forensic Toxicology and Pharmacology | 04           | 03      | 01                  | Basic understanding of chemistry. |

### Course Outcomes:

Upon successful completion of this course, students will be able to:

1. Understand the principles of toxicology, pharmacology, and xenobiotic metabolism relevant to forensic science.
2. Explain the mechanisms of toxicity, drug action, and toxicological analysis of biological samples.
3. Apply analytical techniques for the detection and identification of drugs, poisons, and toxic substances.
4. Evaluate toxicological findings in medico-legal investigations and interpret laboratory reports.

### Learning Objectives:

After completion of this course, students will be having

1. Basic principles of toxicology and pharmacology.
2. To help students learn about xenobiotics and toxic effects.
3. Understand the concepts of mechanism of toxicity.
4. To study and understand the action of various drugs.

### Unit I: Concepts of Toxicology (12 Hours)

Toxicants and Types of Toxicants, Sources of poisoning Laws and Regulations in toxicological testing, Regulatory bodies national and International, Risk and Hazard characterization Factors affecting toxicity toxicokinetic and toxicodynamic processes, detoxification of xenobiotics, biotransformation of xenobiotics, bioaccumulation of xenobiotics, antidotal therapy.

### Unit II: Post-mortem Toxicology (11 Hours)

Toxic effects of heavy metals, mechanism of heavy metal toxicity, Toxic effects of Alcohol and solvents, mechanism of poisonous liquor, Toxic effects of plant poisons, Toxic effects of insects and animal poison Methods of poison detection, chemical tests, Instrumental methods for toxicological examination, Toxicological analysis of decomposed material and body remains, challenges in forensic toxicological examination, Report Writing.

### Unit III: Basic Principles of Forensic Pharmacy (11 Hours)

Introduction to Pharmacology and Forensic Pharmacy, Schedules of Drug, classification of drugs new drug Development, Route of administration of Drugs, Factor affecting the effects of Drug, Adverse drug reactions, Drug Dependence, Rational use of Medicines. Pharmacokinetics: L-ADME, Bioavailability, Bioequivalence, Drug Receptor concept, types of receptors and mechanism of action, Pharmacokinetic drug interactions, various biological barriers, drug hypersensitivity.

#### **Unit IV: Concepts of Pharmacology (11 Hours)**

Role of Catecholamines: Serotonin, Dopamine, Norepinephrine & Epinephrine, General Anaesthetics, Sedatives, Hypnotics, antihypertensive drugs, NSAIDs, Antidepressant, CNS-Stimulants, Antipsychotics, Antiepileptics, Chemo therapeutic drugs, Anti-Biotics, Anti-Fungal, Performance Enhancement Hormone & Drugs. Methods of extraction, Colorimetric Analysis, Instrumental techniques, Immuno-assay techniques of Various drugs. Standards of Quality control & Quality assurance in the pharmaceutical analysis, National & International Notable Case Studies.

#### **Practical's (30 Hours)**

1. Plotting of calibration curve and quantification using UV-Vis Spectroscopy
2. Concept & Parts identification of GC, GCMS, HPLC
3. Identification of common plant poisons Oleander, Dhatura, Calotropis and Ricin etc. by various analytical methods
4. Extraction of heavy metals by conventional methods and analysis by color tests.
5. Identification of non-volatile poisons by UV and TLC
6. Extraction and identification of pesticides from biological matrices by TLC and GC-MS

**Assessment Method:** As per university guidelines

#### **Suggested Readings**

1. Curry: Analytical Methods in Human Toxicology, Part II, 1986.
2. Gupta, P.K. Fundamentals of Toxicology: Essential Concepts and Applications. India, Elsevier Science, 2016.
3. Holfmann, F.G.: Handbook of Drug and Alcohol Abuse.
4. Samford: Poisons Their Isolation Identification
5. Mule, S. J. et al.: Immunoassays for Drugs subjects to ab, CRC Press, 1974
6. Connors, K.: A text book of pharmaceuticals analysis, Interscience, New York, 1975
7. Klaassen, C. D.: Casarett and Doull's Toxicology: The Basic Science of Poisons, 5th ed, McGraw-Hill, 1995.
8. Moffat, A.C.: Osselton, D. M. Widdop, B.: Clarke's Analysis of Drugs and Poisons in Pharmaceuticals, body fluids and postmortem material, 3rd ed., Pharmaceutical Press 2004.

## DSE-12 FORENSIC ACCOUNTING

| Paper               | Total Credit | Lecture | Practical/ Practice | Pre-requisite of the course         |
|---------------------|--------------|---------|---------------------|-------------------------------------|
| Forensic Accounting | 04           | 04      | 00                  | Basic Knowledge of Forensic Science |

### Course Outcomes

1. To understand the fundamental concepts and develop proficiency
2. To learn investigative techniques in the area of forensic accounting.
3. To explore specialized areas within the field of forensic accounting.

### Learning Objectives

After completion of this course, the learners will be able to:

1. Explain the fundamental concepts of forensic accounting.
2. Develop expertise in investigative techniques used in forensic accounting.
3. Understand money laundering, bankruptcy investigations, and litigation support for addressing complex financial issues.
4. Apply theoretical knowledge and practical skills to analyze reports and communicate findings effectively.

### Unit I: Forensic Accounting & Fraud Auditing Fundamentals (15 Hours)

Meaning, nature and scope of Forensic Accounting, Auditors liability for undetected frauds, Fraud auditing (forensic audit) phases: Recognition and planning, Understanding Fraud and Types of Financial Crimes. Evidence collection and evaluation, Communication of results. Fraud Detection and Prevention Strategies.

### Unit II: Fraud Definition & Taxonomy (15 Hours)

Ingredients of fraud, why is a fraud committed and who commits a fraud? Meaning and nature of corporate fraud, concept of fraud under Companies Act 2013, frauds for and against a company, victims of fraud. Money Laundering and Terrorism Financing. Bankruptcy and Insolvency Investigations.

### Unit III: Fundamentals of Penetration Testing (15 Hours)

Types of Corporate Frauds: Bribery and corruption, Misappropriation of assets, Manipulation of financial statements, Procedure-related frauds, corporate espionage, Fraud in e-commerce. Fraud Prevention- Strategies, Fraud prevention for consumers and businesses. Insurance Claims and Fraudulent Activities. Litigation Support and Expert Witness Testimony. Practical Applications -

Application of Investigative Techniques. Analysis of Financial Statements and Fraudulent Transactions.

#### **Unit IV: Auditing (15 Hours)**

Auditing Concept, Type, Principles, Internal Control- Internal Check and Internal Audit, Vouching and Verification of Assets and Liabilities. Dividend and Divisible Profits, Company Auditor: Qualifications and disqualifications, Appointment, Removal, Remuneration, Rights, Duties and Liabilities, Audit Committee, Auditor's Report: Contents and Types, Auditor's Certificates.

**Assessment Method-** Internal assessment, end-term theory examination.

#### **Suggested Readings**

1. Baldava, S., & Agarwal, D. (2021). Forensic Investigations and Fraud Reporting in India: Practical insights to Predict, Prevent, Detect and Investigate Frauds. Bloomsbury India.
2. Bansal, A. (2017). Forensic Accounting & Audit Anticipation in India. LAP Lambert Academic Publishing.
3. Devarajappa S., Gurudath A.S., Yadav R.A. (2015). Forensic Accounting and Auditing. Himalaya Publishing House Pvt. Ltd.
4. Devi, D. S. (2023). Basics of Forensic Accounting. Iterative International Publishers IIP.
5. Joshi, A. (2012).
5. Kaur, K. (2019). Forensic Accounting and Auditing. Kanwaljeet Khorana.
6. Khan, A. (2024). Forensic Accounting, Fraud Investigation and Fraud Analytics.

## DSE-13 FORENSIC ANALYTICAL CHEMISTRY

| Paper                         | Total Credit | Lecture | Practical/<br>Practice | Pre-requisite of the course       |
|-------------------------------|--------------|---------|------------------------|-----------------------------------|
| Forensic Analytical Chemistry | 04           | 03      | 01                     | Understanding of basic chemistry. |

### Course Outcomes

1. This course aims to provide comprehensive knowledge of forensic drug chemistry, petro forensics, fire chemistry, and explosives chemistry.
2. Students will learn to analyses narcotics, explosives, and petroleum products using various forensic techniques and instruments.
3. They will develop expertise in presumptive, screening, and confirmatory methods, as well as the interpretation of forensic data and report writing.
4. Additionally, students will gain an understanding of chemical warfare agents and their detection methods.

### Learning Objectives

Upon successful completion of this course, students will be able to:

1. Analyze and identify various narcotic drugs and controlled substances
2. Apply presumptive and confirmatory methods, including chromatographic and spectroscopic techniques.
3. Conduct forensic analysis of petroleum products and investigate fire-related incidents.
4. Evaluate the properties and mechanisms of explosives and chemical warfare agents.

### Unit I: Advanced Forensic Drug Chemistry (12 Hours)

Drug Trafficking, Forensic examination of drugs/Narcotics - Cannabis, Phenethylamines (Amphetamine, Methamphetamine), Hydroxyl derivative (Ephedrine), Ketone Derivative (Cathinone), Methoxy Derivative (Mescaline), Tertiary Amines (Cocaine and Opiates), Tryptamines (Psilocin and Psilocybin), Anabolic Steroids, Miscellaneous Controlled Substances (Barbiturates, Benzodiazepines, GHB, Ketamine and LSD).

### Unit II: Detection Methods for the Narcotic Drugs (11 Hours)

Colour/spot test, microscopic examination, Microcrystalline tests, Thin-Layer Chromatography, Sample Preparation before TLC Specimen, Extraction Evaluation of TLC for Drug Screening, Immunoassay Methods other instrumental techniques (HPLC, GC, GC-MS) involved in analysis.

Determination of origin of narcotic drug by IRMS, Elemental Profiling by ICP-MS-MS Format of NDPS Report Writing & Courtroom Testimony. Case studies.

### **Unit III: Petro and Fire Forensics (11 Hours)**

Petro Forensics: Distillation and fractionation of petroleum. Commercial uses of different petroleum fractions. Physical Properties of Petroleum Products Analytical Techniques: Quantitative and Qualitative Steps in Analysis of Petroleum, Analysis of traces of petroleum products in forensic exhibits. Case studies. Fire Chemistry: Scientific Investigation of Fire, NFPA 921 and NFPA 1033, Separation and analytical techniques of ignitable liquid residues, Interpretation of Data Obtained from Fire Debris, Quality Assurance in Fire Debris Analysis, Report Writing and Court Testimony. Case studies.

### **Unit IV: Explosives Chemistry (11 Hours)**

Introduction and assessment of explosives, Oxygen balance, Explosive Power Index, Heat and Temperature of Explosion, Pressure of explosion, Mechanism of Ignition and hot spot formation. Thermal decomposition, physical and chemical aspects of combustion, Deflagration and Detonation, Analysis of low and high explosives by different instrumental techniques, Quality control, Proficiency Testing, Interpretation and Significance of Results. Case studies Chemical Warfare Agents: Classification, physical and biochemical properties, toxic effects detection by Biosensors and various instrumental techniques.

### **Practical's (30 Hours)**

1. Separation of Psychotropic substance by TLC.
2. Separation of Cannabis TLC, UV, FTIR
3. Analysis of NDPS drugs and explosives by instrumental techniques
4. Analysis of high explosives by TLC, UV, FTIR
5. Qualitative Analysis of fire residues by GC-HS and GC-MS.

**Assessment Method-** As per University guidelines

### **Suggested Readings**

1. Clarke's Analysis of Drugs and Poisons, (Formerly Isolation & Identification of Drugs) 3rd Ed. Vol. Set.
2. Clark, E.G.C.: Isolation and identification of Drugs, VI and Vol. II, 1966, 1975-1986.
3. Modi, Text Book of Medical Jurisprudence Forensic Medicines and Toxicology (1999) CBS Pub. New Delhi.
4. Saferstien (1982) Forensic Science, Handbook, Vol. I, II & III, Prentice Hall Inc. USA.
5. DFS -Working Procedure Manual- Narcotics.

## **DSE-14 CRYPTOGRAPHY & STEGANOGRAPHY**

| <b>Paper</b>                            | <b>Total Credit</b> | <b>Lecture</b> | <b>Practical/ Practice</b> | <b>Pre-requisite of the course</b>                                  |
|-----------------------------------------|---------------------|----------------|----------------------------|---------------------------------------------------------------------|
| <b>Cryptography &amp; Steganography</b> | <b>04</b>           | <b>03</b>      | <b>01</b>                  | Basic understanding of encryption, decryption and digital forensic. |

### **Course Outcomes:**

1. To understand basics of cryptography and steganography
2. To learn how data is secured and hidden
3. To develop skills to detect encrypted and concealed information

### **Learning Objectives:**

Students will be able to:

1. Explain basic encryption techniques
2. Understand how hidden data works
3. Identify and analyze digital evidence in simple cases

### **Unit I: Fundamentals of Cryptography (12 Hours)**

Introduction, history, and importance of cryptography. Security goals: Confidentiality, Integrity, Authentication, Non-repudiation. Types: of Cryptography. Classical ciphers: Caesar, Vigenère, Playfair. Role of cryptography in digital forensics and cybercrime.

### **Unit II: Modern Cryptographic Techniques & Applications (11 Hours)**

Basic ideas of Block and stream ciphers. Data Encryption Standard (DES) and Advanced Encryption Standard (AES). RSA algorithm (basic concept). Hash functions: MD5, SHA family. Digital signatures and certificates. Cryptographic protocols and secure communication.

### **Unit III: Cryptanalysis and Forensic Investigation (11 Hours)**

Introduction to cryptanalysis. Attack methods: brute force, frequency analysis, known-plaintext attack. Password cracking and recovery techniques. Encryption in cybercrime (dark web, ransomware). Legal and ethical considerations.

### **Unit IV: Steganography (11 Hours)**

Introduction and principles of steganography. Steganography vs cryptography. Types of Steganography: text, image, audio, video steganography. Techniques of Steganography LSB, masking, filtering, transform domain methods. Steganalysis, Tools and forensic approaches for hidden data extraction.

### **Practical's (30 Hours)**

1. To perform AES/RSA encryption-decryption exercises.
2. Data hiding in images/audio using steganography tools.
3. Introduction to forensic tools (Autopsy, FTK basics)
4. Hashing and password cracking.

**Assessment Method:** As per university guidelines

### **Suggested Readings**

1. W.Stallings - Cryptography and Network Security 6<sup>th</sup> Edition
2. Steganography: Seeing the Unseen by Neil F. Johnson, Zoran Duric, and Sushil Jajodia
3. ***Handbook of Applied Cryptography*** by Alfred J. Menezes, Paul C. van Oorschot, and Scott A. Vanstone.
4. *Cryptography and Network Security* is a textbook by Behrouz A.

## DSE-15 RESEARCH METHODOLOGY

| Paper                | Total Credit | Lecture | Practical/ Practice | Pre-requisite of the course             |
|----------------------|--------------|---------|---------------------|-----------------------------------------|
| Research Methodology | 04           | 03      | 01                  | Basic understanding of forensic science |

### Course Outcomes:

1. Understand advanced concepts and theoretical foundations of anthropological research
2. Integrate qualitative, quantitative, and holistic research methodologies
3. Develop competence in the tools and techniques used for the data collection in the field.
4. To develop competence in the advanced laboratory research techniques
5. To Apply the ethical principles in data collection and analysis.

### Learning Objectives:

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

1. Explain advanced concepts and theories of anthropological research
2. Apply qualitative, quantitative, and holistic research methodologies
3. Demonstrate proficiency in advanced field data collection techniques
4. Perform advanced laboratory research techniques
5. Apply ethical principles in anthropological research

### Theory

#### Unit 1: Foundations of Forensic Research (12 Hours)

Nature and scope of forensic research; Scientific method and evidence-based forensic science; Interdisciplinary nature of forensic investigations; Research problem identification, formulation of research questions, objectives and hypotheses; Philosophical foundations of forensic research—Positivism, Empiricism, Objectivity and Scientific Reasoning; Reliability, validity and reproducibility in forensic research; Ethics, integrity and quality assurance in forensic investigations.

#### Unit 2: Research Design and Methodological Approaches (12 Hours)

Research design and its types—exploratory, descriptive, analytical, experimental, cross-sectional longitudinal and case-control studies; Qualitative, quantitative and mixed-method research approaches; Sampling strategies and sample size considerations in forensic research; Experimental design and validation studies; Statistical methods for forensic research; AI, machine learning and digital technologies in forensic science research.

#### Unit 3: Crime Scene Research and Data Collection Techniques (10 Hours)

Advanced crime scene documentation; Photography, videography, 3D documentation and digital imaging; Development of data collection tools including observation schedules, questionnaires and interview protocols; Chain of custody and evidence documentation; Laboratory notebook maintenance; Case studies, report writing and interpretation of forensic findings; Literature review and scientific

databases.

#### **Unit 4: Advanced Laboratory and Analytical Techniques (11 Hours)**

Selection and validation of analytical methods; Instrumental techniques in forensic science; Biological, chemical and physical evidence examination; Molecular techniques, forensic DNA analysis and biomarkers; Spectroscopic and chromatographic applications; AI and machine learning in forensic data analysis; Quality assurance, quality control and accreditation (ISO/IEC 17025); Ethical and legal issues in forensic research.

#### **Practical (30 Hours)**

1. Formulation of a forensic research problem, objectives and hypotheses.
2. Preparation of a research proposal and experimental design.
3. Literature search using scientific databases and reference management software (Mendeley/Zotero).
4. Preparation of questionnaires, observation schedules and interview formats for forensic research.
5. Crime scene documentation using photography, sketching and digital recording.
6. Sampling strategies for biological, chemical and physical evidence.
7. Data coding, tabulation and descriptive statistical analysis using MS Excel/SPSS/R.
8. Interpretation of analytical data generated from forensic laboratory reports.
9. Preparation of scientific graphs, tables and data visualization.
10. Plagiarism checking and scientific referencing using APA/Vancouver style.
11. Preparation of scientific posters and oral presentations.
12. Writing a forensic research report/manuscript following standard scientific format.
13. Critical appraisal of published forensic research articles.
14. Seminar presentation and viva voce on a selected forensic research topic.

**Assessment Method-** As per University Guidelines

#### **Suggested Readings**

1. Houck, M.M., & Siegel, J.A. (2024). Fundamentals of Forensic Science (5th ed.). Academic Press.
2. Saferstein, R. (2023). Criminalistics: An Introduction to Forensic Science (13th ed.). Pearson.
3. Robertson, B., & Vignaux, G.A. (2016). Interpreting Evidence: Evaluating Forensic Science in the Courtroom (2nd ed.). Wiley.
4. Curran, J.M., Buckleton, J.S., & Gill, P. (2020). Forensic Interpretation of Glass Evidence. CRC Press.
5. Creswell, J.W., & Creswell, J.D. (2023). Research Design: Qualitative, Quantitative and Mixed Methods Approaches (7th ed.). Sage.
6. Kumar, R. (2020). Research Methodology: A Step-by-Step Guide for Beginners (5th ed.). Sage.
7. ISO/IEC 17025:2017. General Requirements for the Competence of Testing and Calibration Laboratories.
8. Sharma, B.R. (Latest Edition). Forensic Science in Criminal Investigation and Trials. Universal Law Publishing.

## DSE-16 FORENSIC NARCOTICS ANALYSIS

| Paper                       | Total Credit | Lecture | Practical/<br>Practice | Pre-requisite of the course      |
|-----------------------------|--------------|---------|------------------------|----------------------------------|
| Forensic Narcotics Analysis | 04           | 03      | 01                     | Understanding of basic chemistry |

### Course Outcomes:

1. Build comprehensive understanding of drugs as well as the chemistry and addiction processes involved.
2. Familiarize with the classification, effects, and legal aspects of drugs of abuse, NDPS Act and its implications.
3. Develop knowledge and skills in the chemistry and analysis of drugs of abuse, and various analytical techniques used for identification and confirmation.
4. Examine the concept of designer drugs and their chemical properties

### Learning Objectives:

1. Upon successful completion of this course, students will be able to:
2. Identify the drugs and concepts of drug abuse.
3. Classify drugs of abuse based on their form, origin, and schedules, and explain their effects and legal implications.
4. Develop proficiency in the analysis of drugs of abuse, and the use of various analytical techniques.

### Unit I: Drug (12 Hours)

Pharmacology of Drug, Drug Use and Misuse, Drug addiction and its problems, Drug Chemistry, Drug Dependence and Chemistry of Addiction, Drug Receptors and Brain Chemistry. Drugs as Evidence, Profiling Examples of Illegal Drugs, United Nations International Drug Control Programme.

### Unit II: Narcotic Drugs and Psychotropic Substances (11 Hours)

Scope and significance of NDPS drugs in forensic science, NDPS Act, Classification and characterization of NDPS drugs, Drug Law Enforcement, Search & Seizure, sampling procedure, forwarding of sample to FSL, Sample preparation for analysis, Preliminary analysis of drugs, reporting of drug cases, Format of NDPS Report Writing & Court Room Testimony, Legal Implications and Data Interpretation.

### **Unit III: Designer drugs (11 Hours)**

Definition, Analogs of Fentanyl and Meperidine (both synthetic opioids), Phencyclidine (PCP), Amphetamines and methamphetamines (which have hallucinogenic and stimulant properties). Opium and Opioids analgesics, Stimulants (Cocaine, Amphetamine & other amphetamine derivatives), Depressants (Barbiturates and Benzodiazepines), Hallucinogens (Cannabis, LSD, Psilocybine and Mescaline), OTC, Inhalant and Volatile Substances, Drugs in sexual assault.

### **Unit IV: Drug Abuse in Sports (11 Hours)**

Drugs of Abuse: Definition, Classification based on Form and Origin, Use, Effects, Introduction, International Olympic Committee (IOC), World Anti-Doping Agency (WADA), NADA, classification of commonly prohibited substances and Performance enhancing Drugs, Steroids, Stack and Pyramid methods, Dope test and Blood Doping, Sampling techniques, analytical approaches.

### **Practical's (30 Hours)**

1. Identification of narcotic drugs: opium and alkaloids, morphine and heroin, cannabis by TLC/ HPLC
2. Analysis of Ganja and charas by color test, TLC/HPTLC
3. Determination of barbiturate by UV -visible Spectrophotometric method.
4. Identification of unknown seized NDPS Drug by chemical methods and Instrumental techniques.
5. Extraction of drugs from hair samples.
6. To demonstrate extraction of drugs from hair samples.

**Assessment Method-** As per University Guidelines

### **Suggested Readings**

1. Clarke's Analysis of Drugs and Poisons, (Formerly Isolation & Identification of Drugs) 3<sup>rd</sup> Ed. 2 Vol. Set.
2. Clark, E.G.C.: Isolation and identification of Drugs, VI and Vol. II, 1966, 1975-1986.
3. Modi, TextBook of Medical Jurisprudence Forensic Medicines and Toxicology (1999) CBS Pub. New Delhi

4. Saferstein (1982) Forensic Science, Handbook, Vol. I, II & III, Prentice Hall Inc. USA.
5. E. Stahl (1969) Thin Layer Chromatography: A Laboratory Handbook.
6. Niesink, RJM; "Toxicology- Principles and Applications", CRC Press, 1996.
7. Chadha, PV; "Handbook of Forensic Medicine & Toxicology", Jaypee Brothers, New Delhi, 2004.
8. Modi, JP; "Textbook of Medical Jurisprudence & Toxicology", N.M. Tripathi Pub, 2001.

## **DSE-17 BIOMETRIC SYSTEMS OF IDENTIFICATION**

| <b>Paper</b>                               | <b>Total Credit</b> | <b>Lecture</b> | <b>Practical/ Practice</b> | <b>Pre-requisite of the course</b>     |
|--------------------------------------------|---------------------|----------------|----------------------------|----------------------------------------|
| <b>Biometric systems of Identification</b> | <b>04</b>           | <b>03</b>      | <b>01</b>                  | General knowledge of forensic science. |

### **Course Outcomes:**

1. Identify the various biometric technologies.
2. Understand biometric technologies applicable in various organizations.
3. Evaluate various Image processing methods.
4. Apply the concept of IRIS and Sensor technologies

### **Learning Objectives:**

1. To understand the basics of Biometrics and its functionalities
2. To learn the role of biometrics in the organization.
3. To learn various image processing techniques.
4. To understand the concept of IRIS and sensors

### **Unit I: Introduction (12 Hours)**

Biometric fundamentals, Biometric technologies, Biometrics Vs traditional techniques, Characteristics of a good biometric system, Benefits of biometrics.

Key biometric processes: verification, identification and biometric matching. Performance measures in biometric systems, Applications of Biometric Systems, Security and Privacy Issues. Fundamentals of Image Processing: Digital Image representation - Fundamental steps in Image Processing Image Enhancement.

### **Unit II: Physiological Biometrics (11 Hours)**

Physiological Biometrics: Leading technologies, finger scan, Facial-scan, Iris-scan, voice scan, components, working principles, competing technologies, strengths and weaknesses, Hand-scan, retina scan, components, working principles, competing technologies, strengths and weaknesses, Fingerprint Patterns, Fingerprint Features, Fingerprint Image, width between two ridges - Fingerprint Image Processing Automated fingerprint identification systems.

### **Unit III: Iris Biometrics (11 Hours)**

Iris System Architecture, Definitions and Notations - Iris Recognition: Iris location, Doubly Dimensionless Projection, Iris code, Comparison - Coordinate System: Head Tilting Problem, Basic Eye Model, Texture Energy Feature.

### **Unit IV: Behavioral Biometrics (11 Hours)**

Behavioral Biometrics: Leading technologies: Signature-scan, Keystroke scan: components, working principles, strengths and weaknesses. Privacy and Standards in Biometrics: Assessing the Privacy Risks of Biometrics Designing Privacy- Sympathetic Biometric Systems, Need for standards different biometric standards.

### **Practical's (30 Hours)**

1. To study the different parameter of gait pattern.
2. To identify the thumb print or finger print by using biometry.
3. To compare the given data sample of thumb print.
4. To determine different type of iris pattern.
5. To find out the key strokes variation in the given samples.
6. To study the heart rate of a normal person and Stressed person.

**Assessment Method-** As per University Guidelines

### **Suggested Readings**

1. Ames Wayman, Anilk Jain, Arun A.Ross , Karthik Nandakumar, —Introduction to Biometrics||
2. John Vacca "Biometrics Technologies and Verification Systems" Elsevier 2007
3. James Wayman, Anil Jain, David Maltoni, DasioMaio(Eds) "Biometrics Systems Technology", Design and Performance Evaluation. Springer 2005
4. Khalid Saeed with Marcin Adamski, Tapalina Bhattasali, Mohammed K. Nammous, Piotrpanasiuk, mariusz Rybnik and soharabh Sgaikh, —New Directions in Behavioral Biometrics||, CRC Press 2017
5. Paul Reid "Biometrics for Network Security "Person Education 2004

## GE-5 FUNDAMENTALS OF NANOTECHNOLOGY

| Paper                          | Total Credit | Lecture | Practical/ Practice | Pre-requisite of the course               |
|--------------------------------|--------------|---------|---------------------|-------------------------------------------|
| Fundamentals of Nanotechnology | 04           | 03      | 01                  | Basic knowledge of science and chemistry. |

### Course Outcomes:

1. Explain fundamentals of nanoscience and nanotechnology
2. Understand synthesis and properties of nanomaterials
3. Identify tools used for nanomaterial characterization
4. Apply nanotechnology in forensic investigations

### Learning Objectives:

1. To introduce basic concepts of nanotechnology
2. To understand synthesis and properties of nanomaterials
3. To explore characterization techniques
4. To study applications of nanotechnology in forensic science

### Unit I: Introduction to nanotechnology (12 Hours)

Definition and history of nanotechnology, Nanoscale and its importance, Classification of nanomaterials (0D, 1D, 2D, 3D), Unique properties of nanoparticles: optical, electrical, mechanical, chemical. Surface area to volume ratio and quantum effects. Applications of nanotechnology in general science.

### Unit II: Synthesis of Nanomaterials (11 Hours)

Top-down and bottom-up approaches of Nanoparticle synthesis. Synthesis of nanoparticles by Physical methods (ball milling, lithography), Chemical methods (sol-gel, precipitation, chemical vapor deposition), Biological or green synthesis (plant extracts, microbes). Factors affecting nanoparticle synthesis. Safety and toxicity of nanomaterials.

### Unit III: Characterization Techniques (11 Hours)

Introduction and importance of characterization Microscopy techniques: Scanning Electron Microscope (SEM), Transmission Electron Microscope (TEM), Atomic Force Microscope (AFM). Spectroscopy techniques: UV–Visible Spectroscopy, X-ray Diffraction (XRD), Fourier Transform Infrared Spectroscopy (FTIR). Particle size and surface analysis.

### Unit IV: Forensic Applications of Nanotechnology (11 Hours)

Role of Nanotechnology in crime detection, Fingerprint detection using nanoparticles, Drug and explosive detection, DNA analysis and biosensors, Nanotechnology in toxicology, Future trends and challenges in forensic nanotechnology.

**Practical's ((30 Hours)**

1. Preparation of simple nanoparticles by biological matrix
2. Study of nanoparticle properties using basic techniques
3. Case studies on forensic applications
4. Visualisation of different types of nanoparticles in microscopy/spectroscopy tools.

**Assessment Method-** As per university guidelines

**Suggested Readings**

1. Introduction to Nanotechnology by *Charles P. Poole Jr.* and *Frank J. Owens*. Publisher John Wiley & Sons in 2003.
2. *Nanotechnology: Principles and Practices* is a textbook authored by S. K. Kulkarni
3. *Nanotechnology: A Gentle Introduction to the Next Big Idea*, 2002 by physicist Mark A. Ratner and engineer Daniel Ratner.
4. *Forensic Science: An Introduction to Scientific and Investigative Techniques* a comprehensive textbook edited by Stuart H. James.

## GE-6 FORENSIC MEDICINE

| Paper             | Total Credit | Lecture | Practical/ Practice | Pre-requisite of the course         |
|-------------------|--------------|---------|---------------------|-------------------------------------|
| Forensic Medicine | 04           | 03      | 01                  | Basic knowledge of forensic science |

### Course Outcomes:

1. Identify, examine and prepare report or certificate in medico-legal cases/situations in accordance with the law of land.
2. Examination of the death body on hanging, and suicide case.
3. Emerging trend for the investigation of death body for justice.
4. To identify the manner of death.

### Learning Objectives:

After studying this paper, the students will know

1. The duties of the first responding officer who receives a call on homicide or suicide case.
2. The steps involved in processing the death scene.
3. The importance of ascertaining whether the crime was staged to appear as suicide or accident.
4. The importance of bloodstain patterns in reconstructing the crime scene.

### Unit I: Forensic Medicine/Medico legal investigation (12 Hours)

Medical jurisprudence, Objectives of medico legal investigation, Death and its causes, types of death, Signs of death. Post mortem changes: classification, manner of death, Estimation of time since death, Post mortem biochemistry of the body fluids, Modern techniques used for the estimation of time since deaths, exhumation,

### Unit II: Death and its Investigation (11 Hours)

Forensic Entomology: Identification of specific insects and their developmental stages (life cycles), Medico legal importance, Crimes against women Introduction to sexual offences, Natural and unnatural sexual offences, Abortion & Infanticide & SIDS, Deaths from starvation. Classification of asphyxia deaths: Hanging, Strangulation, evidence collection and analysis,

establishing manner of deaths, Suffocation, Drowning and traumatic asphyxia, medico legal importance of diatoms, medico legal importance.

### **Unit III: Medicolegal Aspects of Injuries (11 Hours)**

Mechanical Injuries: Abrasions, Bruises, Lacerations, Incised wounds, Stab wounds, Firearm injuries, Defence injuries, fabricated injuries, vital clues for establishing the manner of deaths due to various injuries, Traffic accident injuries, Thermal injuries, Deaths due to electrocution - lightning, Electricity, Deaths due to explosions, Deaths due to Chemical trauma, Artificial Injuries.

### **Unit IV: Death Investigation (11 Hours)**

Process of investigation and approach of investigator at the scene of death. Dying declaration. Dying deposition. Identifying of possible suspects and their interview. Interview of possible suspects, witnesses, and onlookers. Suspect in custody – initial interrogation and searching for evidence.

### **Practical's (30 Hours)**

1. Test to differentiate between methanol and ethanol.
2. Extraction of poison by different techniques
3. Postmortem examination in various Asphyxial deaths.
4. Postmortem examination of various homicidal/ accidental injuries.
5. Microscopic Examination of Diatoms.
6. To Study the cases of drowning
7. To study the Cases of hanging

**Assessment Method-** As per University Guidelines

### **Suggested Readings**

1. Sharma, B.R.; “Forensic Science in Criminal Investigation & Trials”, Universal Publishing Co., New Delhi,
2. Chadha, PV; “Handbook of Forensic Medicine & Toxicology”, Jaypee Brothers, New Delhi,
3. O'Hara CE and Osterburg, JW; “An Introduction to Criminalistics”, Indiana Univ. Press, London,
4. J. Dix, Handbook for Death Scene Investigations, CRC Press, Boca Raton.
5. H.B. Baldwin and C.P. May in, Encyclopedia in Forensic Science Volume 1, J.A. Siegel, P.J. Saukko and G.C. Knupfer (Eds.), Academic Press, London.
6. V.J. Geberth, Practical Homicide Investigation, CRC Press, Boca Raton.

## **Skill Based/Workshop/Specialized Laboratory/Hands on Learning**

### **SEC-4 DIGITAL EVIDENCE ANALYSIS WITH LABORATORY**

#### **TRAINING**

| <b>Paper</b>                                              | <b>Total Credit</b> | <b>Theory</b> | <b>Practical/ Practice</b> | <b>Pre-requisite of the course</b> |
|-----------------------------------------------------------|---------------------|---------------|----------------------------|------------------------------------|
| <b>Digital Evidence Analysis with Laboratory training</b> | <b>02</b>           | <b>01</b>     | <b>01</b>                  | Basic knowledge of computers       |

#### **Course Outcomes**

After completion of this course, the learners will be able to:

1. To understand the principles, legal requirements, and best practices for handling digital evidence.
2. To develop practical skills in the acquisition, preservation, examination, and documentation of digital evidence using forensic tools.
3. To acquire competency in the interpretation and reporting of digital forensic findings.
4. To familiarize students with emerging trends and technologies in digital forensic investigations.

#### **Learning Objectives**

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

1. Demonstrate safe laboratory practices and follow standard operating procedures during digital evidence examination.
2. Acquire, preserve, document, and examine digital evidence using appropriate forensic software and tools.
3. Interpret and report digital forensic findings while maintaining the integrity and admissibility of evidence.
4. Evaluate the applications, limitations, and recent developments in digital forensic technologies.

#### **Theory**

##### **Unit I: Fundamentals of Digital Evidence Management (8 Hours)**

Nature and characteristics of digital evidence; Types and sources of digital evidence; Digital evidence lifecycle; Identification, collection, packaging, preservation, acquisition, and documentation of digital evidence; Chain of custody; Standard Operating Procedures (SOPs); Good Laboratory Practices (GLP); Legal and ethical considerations; Overview of national and international guidelines for digital evidence handling.

##### **Unit II: Digital Forensic Reporting and Emerging Technologies (7 Hours)**

Digital forensic workflow; Documentation and report writing; Interpretation and presentation of digital evidence; Validation and verification of forensic tools; Quality assurance and quality control in digital forensic laboratories; Challenges in cloud computing, mobile devices, Internet of Things (IoT), and social media investigations; Artificial Intelligence and automation in digital forensics; Recent trends and future directions in digital evidence analysis.

**Practical 30 hours**

1. Laboratory safety, ethics, and standard operating procedures in digital forensics.
2. Identification, collection, packaging, preservation, and documentation of digital evidence.
3. Acquisition of forensic images using FTK Imager.
4. Recovery of deleted files using forensic software.
5. Email header analysis and email artefact examination.
6. Keyword searching and indexing using forensic tools.
7. Introduction to cloud evidence acquisition.
8. Basic packet capture using Wireshark.
9. Steganography detection using forensic tools.
10. Password recovery techniques (Demonstration).
11. Hash database creation and duplicate file identification.

**Laboratory Tools/Software**

- FTK Imager
- Autopsy
- EnCase
- X-Ways Forensics
- Wireshark
- OSForensics
- Registry Viewer
- HashCalc/HashMyFiles
- ExifTool
- Bulk Extractor

**Assessment Method-** As per University Guidelines

**Suggested Readings**

1. Nelson, B., Phillips, A., and Steuart, C. Guide to Computer Forensics and Investigations. 6th Edition. Cengage Learning.

1. Sammons, J. The Basics of Digital Forensics: The Primer for Getting Started in Digital Forensics. 3rd Edition. Syngress/Elsevier.
2. Bureau of Police Research and Development (BPR&D). Manual on Cyber Crime Investigation.
3. Directorate of Forensic Science Services (DFSS), Government of India. Standard Operating Procedures for Digital Evidence Examination.
4. ISO/IEC 27037. Guidelines for Identification, Collection, Acquisition, and Preservation of Digital Evidence.

**SEC-5 EVIDENCE HANDLING WITH LABORATORY  
TRAINING**

| <b>Paper</b>                                      | <b>Total Credit</b> | <b>Theory</b> | <b>Practical/<br/>Practice</b> | <b>Pre-requisite of the course</b>  |
|---------------------------------------------------|---------------------|---------------|--------------------------------|-------------------------------------|
| <b>Evidence Handling with Laboratory training</b> | <b>02</b>           | <b>01</b>     | <b>01</b>                      | Basic knowledge of forensic science |

**Course Outcomes**

**After completion of this course, the learners will be able to:**

1. To understand the principles and procedures involved in the handling, preservation, and management of forensic evidence.
2. To develop practical skills in the collection, packaging, labeling, transportation, and documentation of different types of forensic evidence.
3. To acquire competency in maintaining the integrity and continuity of evidence throughout the forensic process.
4. To familiarize students with legal, ethical, and quality assurance practices in evidence handling.

**Learning Objectives**

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

1. Demonstrate safe laboratory and crime scene practices while handling forensic evidence.
2. Collect, package, preserve, document, and transport different types of forensic evidence following standard protocols.
3. Maintain chain of custody and prepare appropriate documentation to ensure the integrity and admissibility of evidence.
4. Evaluate the importance of quality assurance, legal requirements, and ethical considerations in evidence handling.

**Theory**

**Unit I: Principles of Evidence Handling and Management (8 Hours)**

Introduction to forensic evidence and its significance; Classification of physical, biological, chemical, and digital evidence; Principles of evidence recognition, collection, packaging, labeling, sealing, preservation, storage, and transportation; Chain of custody and continuity of evidence; Standard Operating Procedures (SOPs); Good Laboratory Practices (GLP); Biosafety, laboratory safety, and use of Personal Protective Equipment (PPE); Prevention of contamination and cross-contamination.

**Unit II: Documentation, Quality Assurance and Legal Considerations (7 Hours)**

Crime scene documentation; Preparation of field notes, evidence inventory, sketches, photography, and videography; Evidence submission and forwarding procedures; Laboratory documentation and record management; Quality assurance and quality control in evidence handling; Accreditation standards and best practices; Legal admissibility of evidence; Ethical considerations; Common errors in evidence handling and their impact on forensic investigations; Case studies.

**Practical****(30 Hours)**

1. Laboratory safety, biosafety, and use of personal protective equipment (PPE).
2. Demonstration of crime scene security, protection, and documentation.
3. Preparation of crime scene sketches, field notes, and evidence inventory.
4. Photography and videography of simulated crime scenes.
5. Collection, packaging, labeling, and sealing of biological evidence (blood, saliva, semen, hair, and tissues).
6. Collection, packaging, and preservation of toxicological and narcotic samples.
7. Collection and packaging of latent fingerprint evidence.
8. Collection and preservation of footwear and tyre impression evidence.
9. Collection, packaging, and forwarding of questioned documents.
10. Identification and prevention of evidence contamination and cross-contamination.
11. Preparation of evidence labels, seals, and forwarding letters.
12. Case study presentation on evidence handling protocols and common errors.

**Assessment Method-** As per University Guidelines

**Suggested Readings**

1. Saferstein, R. Criminalistics: An Introduction to Forensic Science. 12th Edition. Pearson Education.
2. Houck, M.M., and Siegel, J.A. Fundamentals of Forensic Science. 4th Edition. Academic Press.
3. Bell, S. Forensic Science: An Introduction to Scientific and Investigative Techniques. 5th Edition. CRC Press.
4. James, S.H., Nordby, J.J., and Bell, S. Forensic Science: An Introduction to Scientific and Investigative Techniques. 5th Edition. CRC Press.
5. Fisher, B.A.J., and Fisher, D.R. Techniques of Crime Scene Investigation. 9th Edition. CRC Press.
6. Sharma, B.R. Forensic Science in Criminal Investigation and Trials. 5th Edition. Universal Law Publishing.

## SEC-6 Big Data Analysis in Forensic Science

| Paper                                        | Total Credit | Theory    | Practical/<br>Practice | Pre-requisite of the course         |
|----------------------------------------------|--------------|-----------|------------------------|-------------------------------------|
| <b>Big Data Analysis in Forensic Science</b> | <b>02</b>    | <b>01</b> | <b>01</b>              | Basic knowledge of forensic science |

### Course Outcomes

After completion of this course, the learners will be able to:

1. To understand the concepts and applications of big data in forensic science.
2. To develop practical skills in the collection, organization, visualization, and analysis of forensic datasets.
3. To acquire competency in using data analysis tools for pattern recognition and forensic decision-making.
4. To familiarize students with ethical, legal, and security issues associated with forensic data analytics.

### Learning Objectives

Upon successful completion of this course, students will be able to:

1. Explain the role and significance of big data analytics in forensic science.
2. Organize, visualize, and analyse forensic datasets using appropriate software tools.
3. Interpret analytical results to identify patterns and support forensic investigations.
4. Apply ethical principles and data security practices while handling forensic data.

### Theory

#### Unit I: Fundamentals of Big Data in Forensic Science (8 Hours)

Introduction to big data and forensic data analytics; Characteristics of big data (Volume, Velocity, Variety, Veracity and Value); Sources of forensic data including crime records, digital evidence, DNA databases, biometric databases, CCTV, social media, and cybercrime data; Data acquisition, cleaning, preprocessing, storage, and management; Introduction to data visualization and forensic intelligence.

#### Unit II: Applications of Big Data Analytics in Forensic Science (7 Hours)

Descriptive and predictive analytics in forensic investigations; Pattern recognition and trend analysis; Crime mapping and hotspot analysis; Introduction to machine learning and artificial intelligence in forensic science; Data privacy, cybersecurity, ethical and legal issues in forensic data analysis; Emerging trends in forensic big data analytics.

### Practical (30 Hours)

1. Introduction to laboratory safety, ethics, and data security in forensic data analysis.
2. Collection and organization of forensic datasets using spreadsheets.
3. Data cleaning, formatting, and preprocessing of forensic datasets.
4. Data visualization using charts, graphs, and dashboards in Microsoft Excel.
5. Statistical summary and descriptive analysis of forensic datasets.
6. Crime trend analysis using publicly available crime statistics.
7. Preparation of pivot tables and dashboards for forensic data.
8. Geographic visualization of crime data using open-source mapping tools.
9. Introduction to data analysis using Python (Pandas) or R (Demonstration).
10. Pattern identification using clustering and filtering techniques.
11. Introduction to machine learning applications in forensic science (Demonstration).

12. Social media and cybercrime data exploration using publicly available datasets.
13. Preparation and presentation of a forensic data analytics report.
14. Case study presentation on the application of big data analytics in forensic investigations.

### **Laboratory Tools/Software**

- Microsoft Excel
- Google Sheets
- Python (Pandas, Matplotlib) (*Demonstration*)
- R Programming (*Demonstration*)
- Tableau Public / Microsoft Power BI
- OpenRefine
- QGIS (Basic Crime Mapping)

**Assessment Method:** As per University guidelines

### **Suggested Readings**

1. Zikopoulos, P., Eaton, C., deRoos, D., Deutsch, T., & Lapis, G. *Understanding Big Data: Analytics for Enterprise Class Hadoop and Streaming Data*. McGraw-Hill.
2. Provost, F., & Fawcett, T. *Data Science for Business*. O'Reilly Media.
3. Bruce, P., Bruce, A., & Gedeck, P. *Practical Statistics for Data Scientists*. O'Reilly Media.
4. Houck, M.M., & Siegel, J.A. *Fundamentals of Forensic Science*. Academic Press.
5. Saferstein, R. *Criminalistics: An Introduction to Forensic Science*. Pearson Education.
6. National Crime Records Bureau (NCRB). *Crime in India* (Latest Annual Report).
7. ISO/IEC 27001. *Information Security Management Systems – Requirements*.

| Curriculum Structure of 2nd Year of PG for Two years PG Programme (3+2) OR   |            |                                       |                                                                                                     |         |            |                                       |                                                            |         |  |
|------------------------------------------------------------------------------|------------|---------------------------------------|-----------------------------------------------------------------------------------------------------|---------|------------|---------------------------------------|------------------------------------------------------------|---------|--|
| One Year PG Programme After Completion of Four-Year UG Programme (4+1)       |            |                                       |                                                                                                     |         |            |                                       |                                                            |         |  |
| Structure-2 (Level-6.5): PG Curriculum Structure with Course Work + Research |            |                                       |                                                                                                     |         |            |                                       |                                                            |         |  |
| Level-6.5                                                                    | Year-2     |                                       |                                                                                                     |         | Year-2     |                                       |                                                            |         |  |
|                                                                              |            |                                       | Paper                                                                                               | Credits |            |                                       | Paper                                                      | Credits |  |
|                                                                              | Semester-3 | DSC-7                                 | Instrumental Techniques in Forensic Analysis -I                                                     | 4       | Semester-4 | DSC-9                                 | Instrumental Techniques in Forensic Analysis- II           | 4       |  |
|                                                                              |            | DSC-8                                 | Introduction to Digital and Cyber Forensics                                                         | 4       |            | DSC-10                                | Questioned Documents and Multimedia Forensics              | 4       |  |
|                                                                              |            |                                       |                                                                                                     | 8       |            |                                       |                                                            | 8       |  |
|                                                                              |            | OPT for either 2 New DSEs OR DSE & GE |                                                                                                     |         |            | OPT for either 2 New DSEs OR DSE & GE |                                                            |         |  |
|                                                                              |            | DSE-5                                 | Human Genetics and Molecular Forensics                                                              | 4       |            | DSE-11                                | Toxicology and Pharmacology                                | 4       |  |
|                                                                              |            | DSE-6                                 | Forensic Genomics, Proteomics and Bioinformatics                                                    |         |            | DSE-12                                | Forensic Accounting                                        |         |  |
|                                                                              |            | DSE-7                                 | Advanced Forensic Anthropology                                                                      |         |            | DSE-13                                | Forensic Analytical Chemistry                              |         |  |
|                                                                              |            | DSE-8                                 | Forensic Engineering                                                                                |         |            | DSE-14                                | Cryptography & Steganography                               |         |  |
|                                                                              |            |                                       |                                                                                                     |         |            | DSE 15                                | Research Methodology                                       |         |  |
|                                                                              |            | GE-3                                  | Fundamentals of Immunological techniques in Forensic science                                        | 4       |            | GE-5                                  | Fundamentals of Nanotechnology                             | 4       |  |
|                                                                              |            | GE-4                                  | Fundamentals of AI and Machine Learning in Forensic science                                         |         |            | GE-6                                  | Forensic Medicine                                          |         |  |
|                                                                              |            |                                       |                                                                                                     | 8       |            |                                       |                                                            | 8       |  |
|                                                                              |            | Dissertation (Original Work)          |                                                                                                     |         |            | Dissertation (Original Work)          |                                                            |         |  |
|                                                                              |            |                                       | Minor Project based on police training/ Laboratory training /court room ethnography for three weeks | 6       |            |                                       | Dissertation: on any specialized field of Forensic Science | 6       |  |
|                                                                              |            |                                       |                                                                                                     | 22      |            |                                       |                                                            | 22      |  |

## **Structure 2 (Course Work + Research)**

SEM-III

## DSC - 7 INSTRUMENTAL TECHNIQUES IN FORENSIC ANALYSIS - I

| Paper                                            | Total Credit | Lecture | Practical/ Practice | Pre-requisite of the course         |
|--------------------------------------------------|--------------|---------|---------------------|-------------------------------------|
| Instrumental Techniques in Forensic Analysis - I | 04           | 03      | 01                  | Basic knowledge of Forensic Science |

### Course Outcomes:

Upon successful completion of this course, students will be able to:

1. Understand the principles and working mechanisms of major instrumental techniques used in forensic science.
2. Explain the applications of microscopy, spectroscopy, electrophoresis, and chromatography in forensic evidence analysis.
3. Develop practical skills in the operation of basic analytical instruments and interpretation of analytical data.
4. Evaluate the suitability, accuracy, and limitations of instrumental techniques for forensic investigations

### Learning Objectives:

After completing the course, students will be able to:

1. Explain the principles and instrumentation of commonly used forensic analytical techniques.
2. Select appropriate instrumental methods for the examination of different types of forensic evidence.
3. Interpret analytical results obtained from spectroscopic, chromatographic, microscopic, and electrophoretic techniques.
4. Demonstrate laboratory competency in sample preparation, instrument handling, and forensic data interpretation.

### Unit 1 Light Microscopy (12 Hours)

Introduction to microscopy, theory and principles of microscopy, Construction, working, and applications of Simple, Compound, Comparison, Fluorescence, Polarized, Stereo and infrared microscopes, Digital microscopy and image analysis in forensic examinations.

### Unit 2 Molecular Spectroscopy (11 Hours)

Introduction to molecular microscopy, theory, principles and application of UV, VIS spectroscopy, IR spectroscopy, Fourier Transform Infrared spectroscopy (FTIR) and Raman spectroscopy, Applications of molecular spectroscopy in forensic examination of drugs, fibers, paints, inks, and

explosives.

### **Unit 3 Electrophoresis (11 Hours)**

Introduction, theory, principle and application of Cross-over electrophoresis, Agarose gel electrophoresis, Polyacrylamide gel electrophoresis, Sodium dodecyl sulphate (SDS) polyacrylamide gel electrophoresis, Pulse field gel electrophoresis, Capillary electrophoresis, Immuno- electrophoresis, Iso-electric focusing.

### **Unit 4 Chromatography (11 Hours)**

Introduction, theory, principle, instrumentation, and forensic applications of Thin Layer Chromatography (TLC), HPTLC, Paper and Column chromatography, High performance liquid chromatography, LC-MS, Ion chromatography. Gas chromatography: Pyrolysis GC, GC-MS, Introduction to Headspace Gas Chromatography (HS-GC) for alcohol and volatile poison analysis.

### **Practical's (30 Hours)**

1. Identification of natural and synthetic fibers using a microscope.
2. To find out the unknown concentration of the given sample using a UV/Vis Spectrophotometer.
3. To study Beer's Lambert's law.
4. To study the Hypochromic and Bathochromic shift using a UV/Vis Spectrophotometer.
5. To study the TLC of different inks of the writing pen.
6. To perform gel electrophoresis of DNA samples
7. To analyses the given compound using FTIR spectra.
8. To perform TLC of phenolphthalein.
9. Quantitative and qualitative analysis of soils from different sources of origin.
10. Differentiation of various toxic textile dyes using FTIR analysis.

**Assessment Method:** As per University guidelines

### **Suggested Readings:**

1. Skoog, D. A., Holler, F. J., & Crouch, S. R. (2021). *Principles of Instrumental Analysis* (7th ed.). Cengage Learning.
2. Hofmann, A., & Clokie, S. (2018). *Wilson and Walker's Principles and Techniques of Biochemistry and Molecular Biology* (8th ed.). Cambridge University Press.
3. Rouessac, F., & Rouessac, A. (2021). *Chemical Analysis: Modern Instrumentation Methods and Techniques* (3rd ed.). Wiley.
4. Saferstein, R. (2023). *Criminalistics: An Introduction to Forensic Science* (13th ed.). Pearson.
5. Bell, S. (2022). *Forensic Chemistry* (3rd ed.). Pearson.
6. Houck, M. M., & Siegel, J. A. (2015). *Fundamentals of Forensic Science* (3rd ed.). Academic Press.
7. Peterson J.R and Mohammad A.A (2001); Clinical and Forensic Application of Capillary Electrophoresis. Springer.
8. Lurie B.J and Wittwer J.D (1983); High Performance Liquid Chromatography in Forensic Chemistry. Taylor and Francis.
9. Newman R, Gilbert M, Gilbert M.W., and Lothridge K (1997); GC-MS guide to Ignitable Liquids. CRC Press.
10. Brown, P. R. (2004); Advances in chromatography.

11. Grahm D. (1973); The use of X-ray Techniques in Forensic Investigation.
12. Settle F.A (1997); Handbook of Instrumental Techniques for Analytical Chemistry. Prentice Hall.

### **DSC-8 INTRODUCTION TO DIGITAL AND CYBER FORENSICS**

| <b>Paper</b>                                       | <b>Total Credit</b> | <b>Lecture</b> | <b>Practical/ Practice</b> | <b>Pre-requisite of the course</b> |
|----------------------------------------------------|---------------------|----------------|----------------------------|------------------------------------|
| <b>Introduction to Digital and Cyber Forensics</b> | <b>04</b>           | <b>03</b>      | <b>01</b>                  | Basic knowledge of Computers       |

#### **Course Outcomes:**

Upon successful completion of this course, students will be able to:

1. Understand the fundamental concepts of digital and cyber forensics and the nature of digital evidence.
2. Explain computer architecture, operating systems, networks, and cybercrimes from a forensic perspective.
3. Apply basic principles of digital evidence acquisition, preservation, and cyber incident investigation.
4. Understand cybersecurity principles, legal aspects, and the use of forensic tools in cybercrime investigations

#### **Learning Objectives:**

After completing this course, students will be able to:

1. Describe the fundamentals of digital forensics, cyber forensics, and digital evidence.
2. Examine computer systems, storage media, operating systems, and networks relevant to forensic investigations.
3. Identify common cybercrimes and explain basic investigation methodologies and evidence preservation procedures.
4. Apply introductory forensic tools and cybersecurity practices for analysing digital evidence and preparing forensic reports.

#### **Unit 1 Computer Fundamentals and Digital Storage (12 Hours)**

Number systems: Binary, Octal, Decimal and Hexadecimal, Conversion and Operations on Binary Number Systems, Representing Information in Hexadecimal and Binary, Logical operations on binary number systems. Computer Architecture: Components of a computer, Input Devices, Central Processing Unit, Primary and secondary Storage Devices, Output Devices. Secondary Storage Devices: Understanding Disk, Volume and Partition, HDD and SSD Structures.

#### **Unit 2 Operating Systems and Computer Networks (11 Hours)**

Role of Operating System, Boot Process, Introduction to Process and Memory Management. Windows OS Architecture - FAT and NTFS File Systems. Computer Network: Basic concepts of Computer Network, Open System Interconnection (OSI) and TCP/IP reference model, Protocols and functionalities of each layer, types of connections, networking devices

### **Unit 3 Cybercrime and Digital Forensics (11 Hours)**

Definition of cybercrime, history, classification and types of cybercrimes (spoofing, phishing, vishing, spamming, SMS bombing, stalking, pornography, etc.), virus, worms, ransomware, malware logic/salami attacks, concept of Ponzi scheme, social media platforms and related crimes, forensic investigation of social media crime, cyber terrorism, financial frauds, portals for reporting cybercrimes in India.

### **Unit 4 Cyber security Fundamentals ((11 Hours)**

Introduction to cyber security, Incident Response Management, cyber security, TRIAD (CIA), cyber-attack on cyber security principles, risk assessment, security audit, best security practices, web application security, network application security, Introduction to digital forensic tools (Autopsy, FTK Imager, Wireshark, and Cellebrite—overview only)

### **Practical's (30 Hours)**

1. To perform conversion between binary, decimal, octal, and hexadecimal number systems
2. To study structure of HDD and SSD
3. To perform audio examination using forensic tools
4. To perform identification of different types of cybercrimes
5. To perform basic web/application security testing
6. To perform incident response steps in a simulated case
7. To perform basic network configuration and IP identification

**Assessment Method:** As per university guidelines

### **Suggested Readings:**

1. Hayes, D. R. (2024). *A Practical Guide to Computer Forensics Investigations* (3rd ed.). Pearson.
2. Oettinger, W. (2023). *Learn Computer Forensics* (2nd ed.). Packt.
3. Carvey, H. (2023). *Investigating Windows Systems* (2nd ed.). Syngress/Elsevier.
4. Nelson, B., Phillips, A., & Steuart, C. (2022). *Guide to Computer Forensics and Investigations* (7th ed.). Cengage Learning.
5. Casey, E. (2024). *Digital Evidence and Computer Crime* (4th ed.). Academic Press.
6. Easttom, C. (2022). *Digital Forensics, Investigation, and Response* (4th ed.). Jones & Bartlett Learning.
7. Stallings, W. (2022). *Computer Organization and Architecture* (11th ed.). Pearson.
8. Stallings, W. (2021). *Network Security Essentials: Applications and Standards* (7th ed.). Pearson.
9. Carrier, B. (2005). *File System Forensic Analysis*. Addison-Wesley.
10. Casey, E. (2011). *Handbook of Digital Forensics and Investigation*. Academic Press.

## DSE- 5 HUMAN GENETICS AND MOLECULAR FORENSICS

| Paper                                  | Total Credit | Lecture | Practical/ Practice | Pre-requisite of the course      |
|----------------------------------------|--------------|---------|---------------------|----------------------------------|
| Human Genetics and Molecular Forensics | 04           | 03      | 01                  | Basic knowledge Forensic Science |

### Course Outcomes:

Upon successful completion of this course, students will be able to:

1. Understand the principles of human genetics and molecular biology relevant to forensic science.
2. Explain molecular techniques used for DNA profiling, sequencing, and genetic marker analysis.
3. Apply genetic principles for human identification, kinship analysis, and forensic investigations.
4. Evaluate the scientific, legal, and ethical aspects of forensic DNA evidence.

### Learning Objectives:

After completing this course, students will be able to:

1. Explain the principles of human genetics and molecular forensic analysis.
2. Perform and interpret basic molecular techniques used in forensic DNA analysis.
3. Analyse DNA profiles for human identification, relationship testing, and biological evidence examination.
4. Evaluate the reliability, statistical significance, and legal admissibility of forensic genetic evidence.

### Unit 1 Fundamentals of Human Genetics (12 Hours)

Structure and function of DNA and RNA; Chromosome organization, karyotyping, and chromosomal abnormalities; Mendelian inheritance and extensions (codominance, incomplete dominance, linkage); Population genetics: allele frequency, Hardy-Weinberg equilibrium; Genetic variation in human populations (SNPs, STRs, VNTRs, InDels)

### Unit 2 Molecular Biology Techniques in Forensics (11 Hours)

DNA extraction methods (organic, Chelex, silica-based); DNA quantification techniques (spectrophotometry, real-time PCR); DNA quality assessment and contamination control; Polymerase Chain Reaction (PCR) and its types; Gel electrophoresis and capillary electrophoresis; DNA sequencing methods (Sanger and Next Generation Sequencing)

### Unit 3 DNA Profiling and Human Identification (11 Hours)

Principles of DNA fingerprinting; STR profiling and CODIS markers; Mitochondrial DNA and Y-chromosome analysis; SNP Analysis; Mixed DNA profile interpretation; Statistical interpretation of DNA Evidence: Random match probability, likelihood ratio, Paternity Index

## Unit 4 Advanced Molecular Forensics and Legal Aspects (11 Hours)

Forensic applications: paternity testing, missing persons, disaster victim identification; DNA databases and their management; Epigenetics and forensic age estimation; Chain of custody and laboratory documentation, Ethical, legal, and social issues in forensic genetics; Quality assurance and accreditation in forensic laboratories.

### Practical's (30 Hours)

1. Restriction digestion of DNA
2. DNA extraction from different forensic biological forensic samples
3. To perform Polymerase chain reaction
4. To perform Agarose gel electrophoresis
5. STR Profiling and report writing using simulated evidences
6. Calculation of Paternity Index and Random Match Probability.
7. Interpretation of DNA sequencing chromatograms or STR electropherograms

**Assessment Method:** As per University Guidelines

### Suggested Readings:

1. Butler, J. M. (2023). *Advanced Topics in Forensic DNA Typing: Methodology* (2nd ed.). Academic Press.
2. Butler, J. M. (2023). *Fundamentals of Forensic DNA Typing* (2nd ed.). Academic Press.
3. Goodwin, W., Linacre, A., & Hadi, S. (2024). *An Introduction to Forensic Genetics* (4th ed.). Wiley-Blackwell.
4. Jobling, M. A., Gill, P., & Hurles, M. (2023). *Human Evolutionary Genetics* (2nd ed.). Garland Science.
5. Primorac, D., & Schanfield, M. (Eds.). (2014). *Forensic DNA Applications: An Interdisciplinary Perspective*. CRC Press. (Classic reference.)
6. Saferstein, R. (2023). *Criminalistics: An Introduction to Forensic Science* (13th ed.). Pearson.
7. Kayser, M., & de Knijff, P. (2011). Improving human forensics through advances in genetics, genomics and molecular biology. *Nature Reviews Genetics*, 12(3), 179–192. (Classic review.)
8. Rapley, R., & Whitehouse, D. (Eds.). (2007). *Molecular Forensics*. Wiley. (Classic reference.)
9. Arenas, M., et al. (2017). Forensic genetics and genomics: Much more than just a human affair. *PLoS Genetics*, 13(9), e1006960.
10. Kowalczyk, M., et al. (2018). Molecular markers used in forensic genetics. *Medicine, Science and the Law*, 58(4), 201–209.

## DSE-6 FORENSIC GENOMICS, PROTEOMICS AND BIOINFORMATICS

| Paper                                            | Total Credit | Lecture | Practical/ Practice | Pre-requisite of the course |
|--------------------------------------------------|--------------|---------|---------------------|-----------------------------|
| Forensic Genomics, Proteomics and Bioinformatics | 04           | 03      | 01                  | Basic knowledge of Biology  |

### Course Outcomes:

Upon successful completion of this course, students will be able to:

1. Understand the principles of genomics, proteomics, and bioinformatics and their applications in forensic science.
2. Explain advanced omics technologies used for human identification and biological evidence characterization.
3. Apply computational tools for biological data analysis and forensic interpretation.
4. Evaluate the scientific, ethical, legal, and societal implications of omics technologies in forensic investigations.

### Learning Objectives:

After completing this course, students will be able to:

1. Explain the principles and applications of genomics, proteomics, and bioinformatics in forensic science.
2. Analyse genomic and proteomic data using appropriate computational tools and biological databases.
3. Interpret omics-based evidence for human identification and forensic investigations.
4. Evaluate the opportunities and limitations of integrated omics approaches in forensic science.

### Unit 1 Forensic Genomics (12 Hours)

Introduction to genomics: structural and functional genomics; Human genome organisation and variation (SNPs, CNVs, STRs); Next Generation Sequencing (NGS) and its forensic applications; Forensic applications of genomics: ancestry inference, phenotyping (hair, eye, skin colour); Epigenomics: DNA methylation in age estimation and tissue identification

### Unit 2 Forensic Proteomics (11 Hours)

Basics of proteomics: protein structure and function; Techniques in proteomics: 2D gel electrophoresis, mass spectrometry (MALDI-TOF, LC-MS/MS); Protein biomarkers in forensic science; Applications: body fluid identification, postmortem interval estimation, hair and fibre analysis, Proteomics in wildlife and species identification

### Unit 3 Bioinformatics in Forensic Science (11 Hours)

Introduction to bioinformatics and biological databases (GenBank, EMBL, DDBJ); Sequence alignment tools (BLAST, ClustalW); Phylogenetic analysis and evolutionary relationships; Forensic DNA databases and data management; Software tools for STR analysis and forensic interpretation

### Unit 4 Integrated Omics and Emerging Trends in Forensic Science (11 Hours)

Multi-omics integration (genomics, proteomics, transcriptomics); Microbiome forensics and its applications; Forensic applications of artificial intelligence and machine learning; Personalized forensics and predictive analysis; Ethical, legal, and privacy concerns in omics data, Future directions in forensic omics

### **Practicals (30 Hours)**

1. Extraction of proteins from biological samples.
2. Estimation of protein concentration using standard biochemical methods.
3. Construction of a Phylogenetic tree from nucleotide and protein sequences
4. To study different protein structures
5. To study the recent advancements in Human Genome Project

**Assessment Method:** As per university guidelines

### **Suggested Readings:**

1. Khan, M. S. (2025). A Comprehensive Overview of Bioinformatics Applications in Forensic Science Related to Omics and Odontology. *THE STETHO*, 6(2), 56-70.
2. Smith, J. H., & Singh, M. (2024). Unlocking Secrets: Bioinformatics' Impact on Forensic Bio-Examinations. *Int. J. Netw. Secur. Its Appl*, 16, 1-15.
3. Muntaha, S. T., Hasnain, M. J. U., Khan, W. A., Rafiq, F., & Pervez, M. T. (2018). Role of bioinformatics in forensic science. *FUUAST Journal of Biology*, 8(1), 133-138.
4. Kopp, P. (2005). Genetics, genomics, proteomics, and bioinformatics. *Clinical Pediatric Endocrinology*, 18-44.
5. Duong, V. A., Park, J. M., Lim, H. J., & Lee, H. (2021). Proteomics in forensic analysis: applications for human samples. *Applied Sciences*, 11(8), 3393.
6. Keane, R. E., Tidy, R. J., Parker, G. J., Gummer, J. P., & Priddis, C. (2024). Mass spectrometry based proteomics: changing the impact of protein analysis in forensic science. *Wiley Interdisciplinary Reviews: Forensic Science*, 6(4), e1516.
7. Mason, K. E., Anex, D., Grey, T., Hart, B., & Parker, G. (2018). Protein-based forensic identification using genetically variant peptides in human bone. *Forensic science international*, 288, 89-96.
8. Baniasad, M., Reed, A. J., Lai, S. M., Zhang, L., Schulte, K. Q., Smith, A. R., ... & Freitas, M. A. (2021). Optimization of proteomics sample preparation for forensic analysis of skin samples. *Journal of proteomics*, 249, 104360.

## **DSE- 7 ADVANCED FORENSIC ANTHROPOLOGY**

| <b>Paper</b>                          | <b>Total Credit</b> | <b>Lecture</b> | <b>Practical/ Practice</b> | <b>Pre-requisite of the course</b> |
|---------------------------------------|---------------------|----------------|----------------------------|------------------------------------|
| <b>Advanced Forensic Anthropology</b> | <b>04</b>           | <b>03</b>      | <b>01</b>                  | Basic knowledge of Biology         |

### **Course Outcomes**

Upon successful completion of this course, students will be able to:

1. Understand advanced concepts of human skeletal biology and their application in forensic anthropology.
2. Apply scientific methods for constructing biological profiles from human skeletal remains.
3. Analyse skeletal trauma, taphonomic changes, and postmortem alterations for medico-legal investigations.
4. Evaluate the role of forensic anthropologists in criminal investigations, disaster victim identification, and humanitarian contexts.

### **Learning Objectives**

After completing this course, students will be able to:

1. Examine and identify human skeletal remains using osteological and anthropometric methods.
2. Estimate sex, age, stature, ancestry, and biological profile from skeletal remains.
3. Interpret skeletal trauma, decomposition, and taphonomic changes in forensic investigations.
4. Apply forensic anthropological methods in crime scene recovery, human identification, and legal proceedings.

### **Unit 1 Human Osteology and Skeletal Biology (12 Hours)**

Detailed study of human skeletal system (axial and appendicular); Bone biology: growth, development, remodeling, and ageing; Skeletal variation and population differences; Metric and non-metric traits in identification; Histological analysis of bone, Human versus non-human skeletal differentiation

### **Unit 2 Biological Profile Estimation (11 Hours)**

Sex determination (morphological and metric methods); Age estimation (subadult and adult skeletal indicators); Stature estimation (long bone measurements, regression formulae); Ancestry estimation and population affinity; Facial reconstruction basics

### **Unit 3 Forensic Taphonomy and Trauma Analysis (11 Hours)**

Taphonomic processes: decomposition, burial, environmental effects; Estimation of postmortem interval (PMI); Types of traumas: blunt force, sharp force, ballistic trauma; Antemortem, perimortem, and postmortem injuries; Mass disasters and commingled remains analysis

### **Unit 4 Forensic Anthropology in Practice and Legal Context (11 Hours)**

Crime scene recovery of skeletal remains; Documentation and chain of custody; Role of forensic

anthropologist in court; Human rights investigations and mass grave analysis; Ethical issues and professional standards.

### **Practicals (30 Hours)**

1. Examination of skeletal remains- long bones- Femur, Humerus.
2. Identification of individuals by long bones and stature estimation
3. Determination of sex and age from Skull with mandible
4. Determination of sex from pelvis and sacrum.
5. Identification of individuals by dental examination
6. Anthropometry - Identification of individuals (in living)

**Assessment Method:** As per university guidelines

### **Suggested Readings:**

1. Pink, C. M., Cornelison, J. B., & Juarez, J. K. (2025). Standardizing Advanced Training in Forensic Anthropology: Defining a Clear Path to Achieve Forensic Specialization in Biological Anthropology. *American Journal of Biological Anthropology*, 186(4), e70055.
2. Franklin, D., & Marks, M. K. (2022). The professional practice of forensic anthropology: Contemporary developments and cross-disciplinary applications. *Wiley Interdisciplinary Reviews: Forensic Science*, 4(2), e1442.
3. Ubelaker, D. H. (2018). Recent advances in forensic anthropology. *Forensic sciences research*, 3(4), 275-277.
4. Christensen, A. M., Passalacqua, N. V., & Bartelink, E. J. (2019). *Forensic anthropology: current methods and practice*. Academic Press.
5. Wescott, D. J. (2018). Recent advances in forensic anthropology: decomposition research. *Forensic sciences research*, 3(4), 278-293.
6. Passalacqua, N. V., Pilloud, M. A., & Congram, D. (2021). Forensic anthropology as a discipline. *Biology*, 10(8), 691.

## **DSE-8 FORENSIC ENGINEERING**

| <b>Paper</b>                | <b>Total Credit</b> | <b>Lecture</b> | <b>Practical/ Practice</b> | <b>Pre-requisite of the course</b>  |
|-----------------------------|---------------------|----------------|----------------------------|-------------------------------------|
| <b>Forensic Engineering</b> | <b>04</b>           | <b>03</b>      | <b>01</b>                  | Basic knowledge of Forensic Science |

### **Course Outcomes:**

Upon successful completion of this course, students will be able to:

1. Understand the principles of engineering science applied to forensic investigations.
2. Explain methods for analysing structural, mechanical, electrical, and material failures.
3. Apply scientific approaches for accident investigation, reconstruction, and interpretation of engineering evidence.
4. Evaluate legal, ethical, and professional aspects of forensic engineering investigations.

### **Learning Objectives**

After completing this course, students will be able to:

- 1.Explain the principles and methodologies of forensic engineering investigations.
- 2.Analyse engineering failures using appropriate scientific and technical approaches.
- 3.Interpret evidence from structural failures, industrial accidents, fires, and traffic collisions.
- 4.Prepare engineering investigation reports consistent with forensic and legal requirements.

### **Unit 1 Fundamentals of Forensic Engineering (12 Hours)**

Definition, scope, and role of forensic engineering; Basic principles of engineering mechanics (force, stress, strain); Types of engineering failures: structural, mechanical, electrical; Modes of failure: fatigue, corrosion, fracture, overload; principle of failure analysis

### **Unit 2 Structural and Material Failure Analysis (11 Hours)**

Structural failures: buildings, bridges, dams; Material science basics: metals, polymers, composites; Fracture mechanics and crack propagation; Corrosion and environmental degradation; Case studies of engineering failures

### **Unit 3 Accident Investigation and Reconstruction (11 Hours)**

Road traffic accident investigation (vehicle dynamics, skid marks); Fire and explosion investigation basics; Industrial accidents and machinery failure; Electrical accidents and short-circuit analysis; Use of simulation and reconstruction tools

### **Unit 4 Forensic Engineering Practice and Legal Aspects (11 Hours)**

Investigation protocols and documentation; Evidence collection and preservation in engineering cases; Role of expert witness in court; Standards, codes, and safety regulations; Ethics and

professional responsibility.

### Practical's (30 Hours)

1. Case study on structure collapse and its analysis.
2. To study burn patterns
3. Microscopic examination of fracture surfaces
4. To study skid, scuff, and yaw marks
5. Preparation of a forensic engineering report based on a given case study

**Assessment Method:** As per University Guidelines

### Suggested Readings:

1. Petty, S. E. (2021). *Forensic engineering*. CRC Press.
2. Franck, H., & Franck, D. (2013). *Forensic engineering fundamentals*. Boca Raton, FL: CRC Press.
3. Noon, R. K. (2020). *Introduction to forensic engineering*. CRC Press.
4. Liptai, L. L. (2009). Forensic engineering and the scientific method. *Journal of the National Academy of Forensic Engineers*, 26(1).
5. Batterman, S. C., & Batterman, S. D. (2002). Forensic engineering. *McGraw-Hill Yearbook of Science & Technology*, McGraw-Hill.
6. Brown, S. (2007). Forensic engineering: Reduction of risk and improving technology (for all things great and small). *Engineering Failure Analysis*, 14(6), 1019-1037.
7. Breysse, D. (2012). Forensic engineering and collapse databases. *Proceedings of the Institution of Civil Engineers-Forensic Engineering*, 165(2), 63-75

## GE-3 FUNDAMENTALS OF IMMUNOLOGICAL TECHNIQUES IN FORENSIC SCIENCE

| Paper                                                        | Total Credit | Lecture | Practical/ Practice | Pre-requisite of the course |
|--------------------------------------------------------------|--------------|---------|---------------------|-----------------------------|
| Fundamentals of Immunological Techniques in Forensic Science | 04           | 03      | 01                  | Basic knowledge of Biology  |

### Course Outcomes:

Upon successful completion of this course, students will be able to:

1. Understand the basic concepts of the immune system and antigen–antibody interactions.
2. Explain immunological techniques commonly used in forensic and diagnostic investigations.
3. Apply serological methods for the identification and analysis of biological evidence.
4. Evaluate the significance and limitations of immunological techniques in forensic science.

## **Learning Objectives:**

After completing this course, students will be able to:

1. Explain the structure and functions of the immune system and immunological components.
2. Interpret antigen–antibody reactions and common serological tests.
3. Apply immunological techniques in the examination of forensic biological evidence.
4. Assess the reliability and medico-legal significance of immunological findings.

## **Unit 1 Basics of the Immune System (12 Hours)**

Overview of immunity: innate and adaptive immunity; Cells of the immune system: lymphocytes, macrophages, dendritic cells, NK cells; Organs of the immune system: primary and secondary lymphoid organs; Antigens and immunogens: properties and types; Cytokines and their functions

## **Unit 2 Antibodies and Antigen–Antibody Reactions (11 Hours)**

Structure and classes of immunoglobulins (IgG, IgM, IgA, IgE, IgD); Antigen–antibody interactions: specificity, affinity, avidity; Principles of serological reactions: precipitation, agglutination; Complement system and its pathways; Hypersensitivity reactions (Types I–IV)

## **Unit 3 Immunological Techniques in Forensic Science (11 Hours)**

Blood group antigens and typing (ABO, Rh system); Serological methods: ELISA, RIA, immunodiffusion, immunoelectrophoresis; Immunoassays for detection of drugs, toxins, and biological fluids; Monoclonal antibodies and their applications; Use of immunology in species identification and paternity testing

## **Unit 4 Advanced Immunology and Clinical Relevance (11 Hours)**

Major Histocompatibility Complex (MHC) and antigen presentation; Immune response regulation and tolerance; Autoimmune diseases and immunodeficiency disorders; Vaccines and immunization principles; Ethical and legal considerations in immunological testing.

## **Practical's (30 hours)**

1. Determination of blood group using Antisera
2. To Determine the Rh factor of given blood sample
3. To perform presumptive tests for blood
4. To perform presumptive tests for saliva
5. To differentiate between Human and animal blood using precipitin test
6. Demonstration of ELISA (Enzyme-Linked Immunosorbent Assay)

**Assessment Method:** As per university guidelines

## **Suggested Readings:**

1. Bier, O. G., Da Silva, W. D., Götze, D., & Mota, I. (2012). *Fundamentals of immunology*. Springer Science & Business Media.
2. Ansell, S. M. (2020). Fundamentals of immunology for understanding immunotherapy for lymphoma. *Hematology 2014, the American Society of Hematology Education Program*

- Book*, 2020(1), 585-589.
3. Woods, M. E. (2017). Fundamentals of immunology and inflammation. In *Nanomedicine for Inflammatory Diseases* (pp. 3-38). CRC Press.
  4. Aruljothi, B., Mangala, K. J., Swain, M. P., & Sukhramani, P. S. (2023). *Basics And Fundamentals Of Immunology*. Academic Guru Publishing House.
  5. Mir, M. A. (Ed.). (2020). *Basics and Fundamentals of Immunology*. Nova Medicine & Health.
  6. Delves, P. J., Martin, S. J., Burton, D. R., & Roitt, I. M. (2017). *Roitt's essential immunology*. John Wiley & Sons.
  7. Novotny, A. M. (2014). *Fundamentals of Immunology*.

## GE-4 FUNDAMENTALS OF AI AND MACHINE LEARNING IN FORENSIC SCIENCE

| Paper                                                              | Total Credit | Lecture   | Practical/ Practice | Pre-requisite of the course  |
|--------------------------------------------------------------------|--------------|-----------|---------------------|------------------------------|
| <b>Fundamentals of AI and Machine Learning in Forensic Science</b> | <b>04</b>    | <b>03</b> | <b>01</b>           | Basic knowledge of Computers |

### Course Outcomes:

Upon successful completion of this course, students will be able to:

1. Understand the fundamental concepts of artificial intelligence, machine learning, and data science relevant to forensic science.
2. Explain methods of data preparation, feature engineering, and predictive modelling.
3. Apply basic machine learning techniques to analyse forensic datasets and solve investigative problems.
4. Evaluate the ethical, legal, and practical implications of AI-based forensic applications.

### Learning Objectives:

After completing this course, students will be able to:

1. Explain the principles of artificial intelligence, machine learning, and data analytics.
2. Prepare and preprocess forensic datasets for machine learning applications.
3. Apply supervised and unsupervised learning algorithms to forensic problems.
4. Interpret machine learning results and assess their reliability, limitations, and ethical implications.

### Unit 1 Foundations of Data Science and Machine Learning (12 Hours)

Overview of Data Science: need, components, and applications; Data Science lifecycle: data collection, processing, analysis, interpretation; Introduction to Machine Learning: human vs. machine learning; Learning problem and hypothesis space; Types of Machine Learning: supervised, unsupervised, reinforcement learning; Applications of ML in forensic science (crime prediction, pattern recognition, biometrics); Issues in Machine Learning: bias, overfitting, data limitations; Tools and platforms for ML (Python, R, basic libraries)

### Unit 2 Data Preparation and Feature Engineering (11 Hours)

Types of data in machine learning (structured, unstructured, categorical, numerical); Exploring data structure and datasets; Data quality issues and remediation (missing data, noise, inconsistencies); Data preprocessing: cleaning, normalization, transformation; Basics of Feature Engineering: concept and importance; Feature transformation: construction, extraction; Feature selection and dimensionality reduction

### **Unit 3 Supervised and Unsupervised Learning (11 Hours)**

Supervised learning: classification and regression concepts; Classification models and workflow; Algorithms: k-Nearest Neighbour (k-NN), Decision Tree, Random Forest, Support Vector Machine (SVM); Regression models: Simple Linear Regression, Multiple Linear Regression, Logistic Regression; Unsupervised learning: concepts and applications; Clustering techniques and association rule mining; Comparison: supervised vs. unsupervised learning

### **Unit 4 Neural Networks, Modelling and Forensic Applications (11 Hours)**

Model building process: selecting, training, and testing models; Model representation and evaluation metrics (accuracy, precision, recall); Artificial Neural Networks (ANN): Biological vs artificial neuron, Activation functions, Network architecture; Learning process in ANN and backpropagation algorithm; Introduction to Deep Learning; AI applications in forensic science: Face recognition and biometrics, Crime pattern analysis, Digital forensics and fraud detection; Ethical and legal considerations in AI-based forensic analysis

### **Practical's (30 Hours)**

1. Loading and exploration of datasets
2. Basic statistical analysis and visualization of forensic datasets.
3. Data cleaning and preprocessing
4. Linear and logistic regression using forensic datasets
5. K-Means clustering.
6. Crime data analysis using real or simulated datasets.
7. Classification using Decision Tree or Random Forest.
8. Basic AI workflow using WEKA or Orange Data Mining.

**Assessment Method:** As per University Guidelines

### **Suggested Readings:**

1. Müller, A. C., & Guido, S. (2022). *Introduction to Machine Learning with Python* (2nd ed.). O'Reilly.
2. Géron, A. (2023). *Hands-On Machine Learning with Scikit-Learn, Keras & TensorFlow* (3rd ed.). O'Reilly.
3. Alpaydin, E. (2021). *Introduction to Machine Learning* (4th ed.). MIT Press.
4. Russell, S., & Norvig, P. (2021). *Artificial Intelligence: A Modern Approach* (4th ed.). Pearson.
5. Datt, S., Chandramouli, S., & Das, A. *Machine Learning*. Pearson.
6. Saferstein, R. (2023). *Criminalistics: An Introduction to Forensic Science* (13th ed.). Pearson.
7. James, S. H., Nordby, J. J., & Bell, S. (2025). *Forensic Science: An Introduction to Scientific and Investigative Techniques* (6th ed.). CRC Press.
8. Goodfellow, I., Bengio, Y., & Courville, A. (2016). *Deep Learning*. MIT Press.

## **MINOR PROJECT BASED ON POLICE TRAINING/ LABORATORY TRAINING /COURT ROOM ETHNOGRAPHY FOR THREE WEEKS**

| <b>Paper</b>         | <b>Total<br/>Credit</b> | <b>Lecture</b> | <b>Practical/<br/>Practice</b> | <b>Pre-requisite of the course</b>     |
|----------------------|-------------------------|----------------|--------------------------------|----------------------------------------|
| <b>Minor Project</b> | <b>06</b>               | <b>00</b>      | <b>06</b>                      | Basic Knowledge of Forensic<br>Science |

**Course Outcomes:** The Minor Project aims to provide students with an opportunity to undertake independent research in a specialized area of forensic science. The course is designed to develop scientific inquiry, critical thinking, problem-solving abilities, and research ethics through the application of theoretical knowledge to practical forensic problems. Students will gain experience in research planning, experimental design, data collection, analysis, interpretation, scientific writing, and presentation while working under the guidance of a faculty supervisor. The project also seeks to enhance laboratory competence, familiarize students with contemporary forensic techniques and instrumentation, and prepare them for professional careers in forensic science, research, and academia.

### **Learning Objectives:**

- Identify and formulate a research problem relevant to forensic science.
- Conduct a comprehensive review of scientific literature and identify research gaps.
- Design and execute experimental studies using appropriate forensic methodologies.
- Apply laboratory techniques, analytical instruments, and statistical tools for data collection and analysis.
- Interpret experimental findings critically and draw scientifically valid conclusions.
- Demonstrate adherence to research ethics, laboratory safety, and quality assurance practices.
- Prepare a scientific dissertation following standard academic and research guidelines.
- Communicate research findings effectively through oral presentations, seminars, and viva-voce examinations.

### **Minor Project Guidelines:**

The Minor Project shall be undertaken individually by each student under the supervision of a faculty member of the Department.

The project topic should be selected from any specialized area of forensic science, including but not limited to forensic biology, forensic chemistry, forensic toxicology, forensic anthropology, questioned documents, fingerprint science, digital forensics, crime scene investigation, forensic psychology, forensic medicine, forensic ballistics, forensic entomology, forensic nanotechnology, environmental forensics, wildlife forensics, or other emerging areas.

Students shall prepare a research proposal containing the title, objectives, literature review, research methodology, expected outcomes, and timeline of work. The proposal shall be approved before commencement of experimental work.

The project shall involve literature review, experimental investigation and/or field study, data analysis, interpretation of results, and preparation of a dissertation. Students are expected to maintain a project diary/laboratory record documenting experimental procedures, observations, and progress throughout the project period.

## SEM-IV

## DSC-9 INSTRUMENTAL TECHNIQUES IN FORENSIC ANALYSIS - II

| Paper                                                  | Total Credit | Lecture   | Practical/ Practice | Pre-requisite of the course             |
|--------------------------------------------------------|--------------|-----------|---------------------|-----------------------------------------|
| <b>Instrumental Techniques in Forensic Analysis II</b> | <b>04</b>    | <b>03</b> | <b>01</b>           | Basic understanding of forensic science |

### Course Outcomes:

1. To understand basic principles of modern analytical instruments
2. To learn applications of microscopy and spectroscopy in forensics
3. To develop knowledge of material analysis techniques
4. To apply instrumental methods in forensic investigations

### Learning Objectives:

Students will be able to:

1. Explain working principles of major forensic instruments
2. Identify appropriate techniques for different types of evidence
3. Interpret analytical results in forensic context
4. Apply instrumental methods in laboratory-based investigations

### Unit 1 Introduction to Microscopy (12 Hours)

Introduction, theory, principles, sample preparation, and applications of electron microscope including Scanning Electron Microscope, Field Emission Scanning Electron Microscope, Transmission Electron Microscope, Energy Dispersive X Ray, Scanning Probe Microscope, Scanning, Tunnelling Electron Microscope (STEM), Atomic Force Microscope, Quantum 3D Microscope, and Confocal Microscopy, Polarizing Microscopy.

### Unit 2 Atomic Spectroscopy (11 Hours)

Introduction, theory, principles, sample preparation, and applications of Atomic Absorption Spectroscopy, Graphite Furnace Atomic Absorption Spectroscopy, Atomic Emission Spectroscopy, Inductively Coupled Plasma Atomic Emission Spectroscopy, Inductively Coupled Plasma Mass Spectroscopy.

### Unit 3 X-Ray Techniques (11 Hours)

Introduction, theory, principles, sample preparation, and applications of X Ray Diffraction, X Ray Fluorescence (Energy and Wavelength Dispersion), Auger Electron Spectroscopy (ESCA)

#### **Unit 4 Thermal Techniques (11 Hours)**

Introduction, theory, principles, sample preparation, and applications of Nuclear Magnetic Resonance Spectroscopy, Neutron Activation Analysis, Thermo Gravimetric Analysis, Differential Thermal Analysis. Glass Refractive Index Measurement (GRIM), Densitometer, Universal Tensile Strength testing equipment (UTM), Immunoassay and Centrifugation techniques.

#### **Practical's (30 Hours)**

1. To analyses various physical evidences using microscopes
2. To perform centrifugation of biological samples.
3. To analyses the given sample by using Mass Spectroscopy.
4. To calculate refractive index of glass by using Refractometer.
5. To analyses the given sample by using XRD and XRF
6. To understand Instrumentation and application of Raman Spectroscopy

**Assessment Method:** As per university guidelines

#### **Suggested Readings:**

1. Robinson J.W, Frame E.M.K and Frame II G.M (2005); Undergraduate Instrumental Analysis. M. Dekker.
2. Skoog D.A, Holler F.J & Crouch S.R (2021); Principles of Instrumental analysis: Cengage Learning Inc.
3. Merrit W and Settle D (1981); Instrumental Methods of Analysis. Van Nostrand.
4. Saferstein R (2015); Criminalistics An introduction to Forensic Science, Pearson.
5. Pavia D.L, Lapman G.L, Kriz G.S and Vyvyan J.R(2015); Introduction to Spectroscopy. Cengage Learning.
6. Chapmen J.R (1993); Practical Organic Mass Spectrometry- A Guide for Chemical and Biochemical Analysis. Wiley & Sons.
7. Chatwal, G.R and Anand S.K. (1984); Instrumental Methods Of Chemical Analysis. Himalaya Publishing House.

## DSC-10 QUESTIONED DOCUMENTS AND MULTIMEDIA FORENSICS

| Paper                                         | Total Credit | Lecture | Practical/ Practice | Pre-requisite of the course         |
|-----------------------------------------------|--------------|---------|---------------------|-------------------------------------|
| Questioned Documents and Multimedia Forensics | 04           | 03      | 01                  | Basic Knowledge of Forensic Science |

### Course Outcomes:

After studying this course, the student will learn to

1. Identify the questioned document at the crime scene.
2. Examine the questioned document using different basic tools.
3. Compare various handwriting and signature samples.
4. Detect frauds and forgeries by analyzing questioned documents.

### Learning Objectives:

1. To explain the nature and scope of questioned documents, including types, characteristics, and the principles of handwriting analysis.
2. To identify various types of document forgeries and alterations and assess their impact.
3. To evaluate handwriting and signature development, document features to determine authenticity.
4. To synthesize findings from document and handwriting analyses to produce comprehensive forensic reports

### Unit 1: Introduction to Questioned Documents (12 Hours)

Nature and Scope of Questioned Documents, definition of questioned documents. Types of Document / Classification of documents, Handling and packing of documents, Procurements of standards- admitted / specimen writings. Preliminary examination of documents. Sections related to Questioned Document Examinations.

### Unit 2: Handwriting and Signature Examination (11 Hours)

Principles of hand writing & signature identification. Class and Individual Characteristics of Handwriting. Disguise writings, Natural Variations. Basic tools needed for forensic documents' examination ultraviolet, visible, infrared and fluorescence spectroscopy, photography of questioned documents, visible spectral comparator, electrostatic detection apparatus.

### Unit 3: Document Forgery and Security Documents (11 Hours)

Forgeries & its types and their detections, Examination of alterations, erasers, overwriting, addition and obliterations, Examination of counterfeit currency notes, passport, credit card, visa, seal and other mechanical impressions. Use of digital technology in the perpetration of white-collar crimes and their detection, digitally manipulated and machine generated documents- their nature, examination and reporting as well as evidence impact.

#### Unit 4: Multimedia Forensics and Advanced Document Examination (11 Hours)

Determination of sequence of strokes, age of document, Physical matching of Documents Printing Devices- impact and non- impact printing, Examination of modern printing techniques, Decipherment of secret & indented writings, ESDA and Examination of charred documents, Examination of typescripts, Xerox- Analog and Digital, computer printouts

#### Practical's (30 Hours)

1. Identification of Handwriting-general characteristics, natural variations, fundamental divergences and individual characteristics
2. To detect Simulated and traced forgeries
3. Examination of additions, erasures, and obliterations in the documents.
4. Examination of writing inks by TLC/ Paper chromatography.
5. To examine the security features of currency notes, passport, cheques etc.
6. To decipher secret writing.

**Assessment Method:** As per University Guidelines

#### Suggested Readings:

1. Albert S. Osborn; Questioned Documents, Second Ed.; Universal Law Publishing, Delhi
2. O. Hilton, *Scientific Examination of Questioned Documents*, CRC Press, Boca Raton
3. R.N. Morris, *Forensic Handwriting Identification: Fundamental Concepts and Principles*, Academic Press, London.
4. E. David, *The Scientific Examination of Documents—Methods and Techniques*, 2<sup>nd</sup> Edition, Taylor & Francis, Hants.
5. Wilson R. Harrison; *Suspect Documents -Their Scientific Examination*; Universal Law Publishing, Delhi- please see publisher
6. Heidi H Harralson: *Huber and Headrick's Handwriting Identification*

#### DSE-11 FORENSIC TOXICOLOGY AND PHARMACOLOGY

| Paper                                | Total Credit | Lecture | Practical/ Practice | Pre-requisite of the course       |
|--------------------------------------|--------------|---------|---------------------|-----------------------------------|
| Forensic Toxicology and Pharmacology | 04           | 03      | 01                  | Basic understanding of chemistry. |

#### Course Outcomes:

Upon successful completion of this course, students will be able to:

1. Understand the principles of toxicology, pharmacology, and xenobiotic metabolism relevant to forensic science.
2. Explain the mechanisms of toxicity, drug action, and toxicological analysis of biological samples.

3. Apply analytical techniques for the detection and identification of drugs, poisons, and toxic substances.
4. Evaluate toxicological findings in medico-legal investigations and interpret laboratory reports.

### **Learning Objectives:**

After completion of this course, students will be having

1. Basic principles of toxicology and pharmacology.
2. To help students learn about xenobiotics and toxic effects.
3. Understand the concepts of mechanism of toxicity.
4. To study and understand the action of various drugs.

### **Unit I: Concepts of Toxicology (12 Hours)**

Toxicants and Types of Toxicants, Sources of poisoning Laws and Regulations in toxicological testing, Regulatory bodies national and International, Risk and Hazard characterization Factors affecting toxicity toxicokinetic and toxicodynamic processes, detoxification of xenobiotics, biotransformation of xenobiotics, bioaccumulation of xenobiotics, antidotal therapy.

### **Unit II: Post-mortem Toxicology (11 Hours)**

Toxic effects of heavy metals, mechanism of heavy metal toxicity, Toxic effects of Alcohol and solvents, mechanism of poisonous liquor, Toxic effects of plant poisons, Toxic effects of insects and animal poison Methods of poison detection, chemical tests, Instrumental methods for toxicological examination, Toxicological analysis of decomposed material and body remains, challenges in forensic toxicological examination, Report Writing.

### **Unit III: Basic Principles of Forensic Pharmacy (11 Hours)**

Introduction to Pharmacology and Forensic Pharmacy, Schedules of Drug, classification of drugs new drug Development, Route of administration of Drugs, Factor affecting the effects of Drug, Adverse drug reactions, Drug Dependence, Rational use of Medicines. Pharmacokinetics: L-ADME, Bioavailability, Bioequivalence, Drug Receptor concept, types of receptors and mechanism of action, Pharmacokinetic drug interactions, various biological barriers, drug hypersensitivity.

### **Unit IV: Concepts of Pharmacology (11 Hours)**

Role of Catecholamines: Serotonin, Dopamine, Norepinephrine & Epinephrine, General Anaesthetics, Sedatives, Hypnotics, antihypertensive drugs, NSAIDs, Antidepressant, CNS-Stimulants, Antipsychotics, Antiepileptics, Chemo therapeutic drugs, Anti-Biotics, Anti-Fungal, Performance Enhancement Hormone & Drugs. Methods of extraction, Colorimetric Analysis, Instrumental techniques, Immuno-assay techniques of Various drugs. Standards of Quality control & Quality assurance in the pharmaceutical analysis, National & International Notable Case Studies.

### **Practical's (30 Hours)**

1. Plotting of calibration curve and quantification using UV-Vis Spectroscopy
2. Concept & Parts identification of GC, GCMS, HPLC
3. Identification of common plant poisons Oleander, Dhatura, Calotropis and Ricin etc. by various analytical methods
4. Extraction of heavy metals by conventional methods and analysis by color tests.
5. Identification of non-volatile poisons by UV and TLC
6. Extraction and identification of pesticides from biological matrices by TLC and GC-MS

**Assessment Method:** As per university guidelines

### **Suggested Readings**

1. Curry: Analytical Methods in Human Toxicology, Part II, 1986.
2. Gupta, P.K. Fundamentals of Toxicology: Essential Concepts and Applications. India, Elsevier Science, 2016.
3. Holfmann, F.G.: Handbook of Drug and Alcohol Abuse.
4. Samford: Poisons Their Isolation Identification
5. Mule, S. J. et al.: Immunoassays for Drugs subjects to ab, CRC Press, 1974
6. Connors, K.: A text book of pharmaceuticals analysis, Interscience, New York, 1975
7. Klaassen, C. D.: Casarett and Doull's Toxicology: The Basic Science of Poisons, 5th ed, McGraw-Hill, 1995.
8. Moffat, A.C.: Osselton, D. M. Widdop, B.: Clarke's Analysis of Drugs and Poisons in Pharmaceuticals, body fluids and postmortem material, 3rd ed., Pharmaceutical Press 2004.

## DSE-12 FORENSIC ACCOUNTING

| Paper               | Total Credit | Lecture | Practical/ Practice | Pre-requisite of the course         |
|---------------------|--------------|---------|---------------------|-------------------------------------|
| Forensic Accounting | 04           | 04      | 00                  | Basic Knowledge of Forensic Science |

### Course Outcomes

1. To understand the fundamental concepts and develop proficiency
2. To learn investigative techniques in the area of forensic accounting.
3. To explore specialized areas within the field of forensic accounting.

### Learning Objectives

After completion of this course, the learners will be able to:

1. Explain the fundamental concepts of forensic accounting.
2. Develop expertise in investigative techniques used in forensic accounting.
3. Understand money laundering, bankruptcy investigations, and litigation support for addressing complex financial issues.
4. Apply theoretical knowledge and practical skills to analyze reports and communicate findings effectively.

### Unit I: Forensic Accounting & Fraud Auditing Fundamentals (15 Hours)

Meaning, nature and scope of Forensic Accounting, Auditors liability for undetected frauds, Fraud auditing (forensic audit) phases: Recognition and planning, Understanding Fraud and Types of Financial Crimes. Evidence collection and evaluation, Communication of results. Fraud Detection and Prevention Strategies.

### Unit II: Fraud Definition & Taxonomy (15 Hours)

Ingredients of fraud, why is a fraud committed and who commits a fraud? Meaning and nature of corporate fraud, concept of fraud under Companies Act 2013, frauds for and against a company, victims of fraud. Money Laundering and Terrorism Financing. Bankruptcy and Insolvency Investigations.

### Unit III: Fundamentals of Penetration Testing (15 Hours)

Types of Corporate Frauds: Bribery and corruption, Misappropriation of assets, Manipulation of financial statements, Procedure-related frauds, corporate espionage, Fraud in e-commerce. Fraud Prevention- Strategies, Fraud prevention for consumers and businesses. Insurance Claims and Fraudulent Activities. Litigation Support and Expert Witness Testimony. Practical Applications -

Application of Investigative Techniques. Analysis of Financial Statements and Fraudulent Transactions.

#### **Unit IV: Auditing (15 Hours)**

Auditing Concept, Type, Principles, Internal Control- Internal Check and Internal Audit, Vouching and Verification of Assets and Liabilities. Dividend and Divisible Profits, Company Auditor: Qualifications and disqualifications, Appointment, Removal, Remuneration, Rights, Duties and Liabilities, Audit Committee, Auditor's Report: Contents and Types, Auditor's Certificates.

**Assessment Method-** Internal assessment, end-term theory examination.

#### **Suggested Readings**

1. Baldava, S., & Agarwal, D. (2021). Forensic Investigations and Fraud Reporting in India: Practical insights to Predict, Prevent, Detect and Investigate Frauds. Bloomsbury India.
2. Bansal, A. (2017). Forensic Accounting & Audit Anticipation in India. LAP Lambert Academic Publishing.
3. Devarajappa S., Gurudath A.S., Yadav R.A. (2015). Forensic Accounting and Auditing. Himalaya Publishing House Pvt. Ltd.
4. Devi, D. S. (2023). Basics of Forensic Accounting. Iterative International Publishers IIP.
5. Kaur, K. (2019). Forensic Accounting and Auditing. Kanwaljeet Khorana.
6. Khan, A. (2024). Forensic Accounting, Fraud Investigation and Fraud Analytics.

## DSE-13 FORENSIC ANALYTICAL CHEMISTRY

| Paper                         | Total Credit | Lecture | Practical/<br>Practice | Pre-requisite of the course       |
|-------------------------------|--------------|---------|------------------------|-----------------------------------|
| Forensic Analytical Chemistry | 04           | 03      | 01                     | Understanding of basic chemistry. |

### Course Outcomes

1. This course aims to provide comprehensive knowledge of forensic drug chemistry, petro forensics, fire chemistry, and explosives chemistry.
2. Students will learn to analyses narcotics, explosives, and petroleum products using various forensic techniques and instruments.
3. They will develop expertise in presumptive, screening, and confirmatory methods, as well as the interpretation of forensic data and report writing.
4. Additionally, students will gain an understanding of chemical warfare agents and their detection methods.

### Learning Objectives

Upon successful completion of this course, students will be able to:

1. Analyze and identify various narcotic drugs and controlled substances
2. Apply presumptive and confirmatory methods, including chromatographic and spectroscopic techniques.
3. Conduct forensic analysis of petroleum products and investigate fire-related incidents.
4. Evaluate the properties and mechanisms of explosives and chemical warfare agents.

### Unit I: Advanced Forensic Drug Chemistry (12 Hours)

Drug Trafficking, Forensic examination of drugs/Narcotics - Cannabis, Phenethylamines (Amphetamine, Methamphetamine), Hydroxyl derivative (Ephedrine), Ketone Derivative (Cathinone), Methoxy Derivative (Mescaline), Tertiary Amines (Cocaine and Opiates), Tryptamines (Psilocin and Psilocybin), Anabolic Steroids, Miscellaneous Controlled Substances (Barbiturates, Benzodiazepines, GHB, Ketamine and LSD).

### Unit II: Detection Methods for the Narcotic Drugs (11 Hours)

Colour/spot test, microscopic examination, Microcrystalline tests, Thin-Layer Chromatography, Sample Preparation before TLC Specimen, Extraction Evaluation of TLC for Drug Screening, Immunoassay Methods other instrumental techniques (HPLC, GC, GC-MS) involved in analysis.

Determination of origin of narcotic drug by IRMS, Elemental Profiling by ICP-MS-MS Format of NDPS Report Writing & Courtroom Testimony. Case studies.

### **Unit III: Petro and Fire Forensics (11 Hours)**

Petro Forensics: Distillation and fractionation of petroleum. Commercial uses of different petroleum fractions. Physical Properties of Petroleum Products Analytical Techniques: Quantitative and Qualitative Steps in Analysis of Petroleum, Analysis of traces of petroleum products in forensic exhibits. Case studies. Fire Chemistry: Scientific Investigation of Fire, NFPA 921 and NFPA 1033, Separation and analytical techniques of ignitable liquid residues, Interpretation of Data Obtained from Fire Debris, Quality Assurance in Fire Debris Analysis, Report Writing and Court Testimony. Case studies.

### **Unit IV: Explosives Chemistry (11 Hours)**

Introduction and assessment of explosives, Oxygen balance, Explosive Power Index, Heat and Temperature of Explosion, Pressure of explosion, Mechanism of Ignition and hot spot formation. Thermal decomposition, physical and chemical aspects of combustion, Deflagration and Detonation, Analysis of low and high explosives by different instrumental techniques, Quality control, Proficiency Testing, Interpretation and Significance of Results. Case studies Chemical Warfare Agents: Classification, physical and biochemical properties, toxic effects detection by Biosensors and various instrumental techniques.

### **Practical's (30 Hours)**

1. Separation of Psychotropic substance by TLC.
2. Separation of Cannabis TLC, UV, FTIR
3. Analysis of NDPS drugs and explosives by instrumental techniques
4. Analysis of high explosives by TLC, UV, FTIR
5. Qualitative Analysis of fire residues by GC-HS and GC-MS.

**Assessment Method-** As per University guidelines

### **Suggested Readings**

1. Clarke's Analysis of Drugs and Poisons, (Formerly Isolation & Identification of Drugs) 3rd Ed. Vol. Set.
2. Clark, E.G.C.: Isolation and identification of Drugs, VI and Vol. II, 1966, 1975-1986.
3. Modi, Text Book of Medical Jurisprudence Forensic Medicines and Toxicology (1999) CBS Pub. New Delhi.
4. Saferstien (1982) Forensic Science, Handbook, Vol. I, II & III, Prentice Hall Inc. USA.
5. DFS -Working Procedure Manual- Narcotics.

## **DSE-14 CRYPTOGRAPHY & STEGANOGRAPHY**

| <b>Paper</b>                            | <b>Total Credit</b> | <b>Lecture</b> | <b>Practical/ Practice</b> | <b>Pre-requisite of the course</b>                                  |
|-----------------------------------------|---------------------|----------------|----------------------------|---------------------------------------------------------------------|
| <b>Cryptography &amp; Steganography</b> | <b>04</b>           | <b>03</b>      | <b>01</b>                  | Basic understanding of encryption, decryption and digital forensic. |

### **Course Outcomes:**

1. To understand basics of cryptography and steganography
2. To learn how data is secured and hidden
3. To develop skills to detect encrypted and concealed information

### **Learning Objectives:**

Students will be able to:

1. Explain basic encryption techniques
2. Understand how hidden data works
3. Identify and analyze digital evidence in simple cases

### **Unit I: Fundamentals of Cryptography (12 Hours)**

Introduction, history, and importance of cryptography. Security goals: Confidentiality, Integrity, Authentication, Non-repudiation. Types: of Cryptography. Classical ciphers: Caesar, Vigenère, Playfair. Role of cryptography in digital forensics and cybercrime.

### **Unit II: Modern Cryptographic Techniques & Applications (11 Hours)**

Basic ideas of Block and stream ciphers. Data Encryption Standard (DES) and Advanced Encryption Standard (AES). RSA algorithm (basic concept). Hash functions: MD5, SHA family. Digital signatures and certificates. Cryptographic protocols and secure communication.

### **Unit III: Cryptanalysis and Forensic Investigation (11 Hours)**

Introduction to cryptanalysis. Attack methods: brute force, frequency analysis, known-plaintext attack. Password cracking and recovery techniques. Encryption in cybercrime (dark web, ransomware). Legal and ethical considerations.

### **Unit IV: Steganography (11 Hours)**

Introduction and principles of steganography. Steganography vs cryptography. Types of Steganography: text, image, audio, video steganography. Techniques of Steganography LSB, masking, filtering, transform domain methods. Steganalysis, Tools and forensic approaches for hidden data extraction.

### **Practical's (30 Hours)**

1. To perform AES/RSA encryption-decryption exercises.
2. Data hiding in images/audio using steganography tools.
3. Introduction to forensic tools (Autopsy, FTK basics)
4. Hashing and password cracking.

**Assessment Method:** As per university guidelines

### **Suggested Readings**

1. W.Stallings - Cryptography and Network Security 6<sup>th</sup> Edition
2. Steganography: Seeing the Unseen by Neil F. Johnson, Zoran Duric, and Sushil Jajodia
3. ***Handbook of Applied Cryptography*** by Alfred J. Menezes, Paul C. van Oorschot, and Scott A. Vanstone.
4. *Cryptography and Network Security* is a textbook by Behrouz A.

## DSE-15 RESEARCH METHODOLOGY

| Paper                | Total Credit | Lecture | Practical/ Practice | Pre-requisite of the course             |
|----------------------|--------------|---------|---------------------|-----------------------------------------|
| Research Methodology | 04           | 03      | 01                  | Basic understanding of forensic science |

### Course Outcomes:

1. Understand advanced concepts and theoretical foundations of anthropological research
2. Integrate qualitative, quantitative, and holistic research methodologies
3. Develop competence in the tools and techniques used for the data collection in the field.
4. To develop competence in the advanced laboratory research techniques
5. To Apply the ethical principles in data collection and analysis.

### Learning Objectives:

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

1. Explain advanced concepts and theories of anthropological research
2. Apply qualitative, quantitative, and holistic research methodologies
3. Demonstrate proficiency in advanced field data collection techniques
4. Perform advanced laboratory research techniques
5. Apply ethical principles in anthropological research

### Theory

#### Unit 1: Foundations of Forensic Research (12 Hours)

Nature and scope of forensic research; Scientific method and evidence-based forensic science; Interdisciplinary nature of forensic investigations; Research problem identification, formulation of research questions, objectives and hypotheses; Philosophical foundations of forensic research—Positivism, Empiricism, Objectivity and Scientific Reasoning; Reliability, validity and reproducibility in forensic research; Ethics, integrity and quality assurance in forensic investigations.

#### Unit 2: Research Design and Methodological Approaches (12 Hours)

Research design and its types—exploratory, descriptive, analytical, experimental, cross-sectional longitudinal and case-control studies; Qualitative, quantitative and mixed-method research approaches; Sampling strategies and sample size considerations in forensic research; Experimental design and validation studies; Statistical methods for forensic research; AI, machine learning and digital technologies in forensic science research.

#### Unit 3: Crime Scene Research and Data Collection Techniques (10 Hours)

Advanced crime scene documentation; Photography, videography, 3D documentation and digital imaging; Development of data collection tools including observation schedules, questionnaires and interview protocols; Chain of custody and evidence documentation; Laboratory notebook maintenance; Case studies, report writing and interpretation of forensic findings; Literature review and scientific

databases.

#### **Unit 4: Advanced Laboratory and Analytical Techniques (11 Hours)**

Selection and validation of analytical methods; Instrumental techniques in forensic science; Biological, chemical and physical evidence examination; Molecular techniques, forensic DNA analysis and biomarkers; Spectroscopic and chromatographic applications; AI and machine learning in forensic data analysis; Quality assurance, quality control and accreditation (ISO/IEC 17025); Ethical and legal issues in forensic research.

#### **Practical (30 Hours)**

1. Formulation of a forensic research problem, objectives and hypotheses.
2. Preparation of a research proposal and experimental design.
3. Literature search using scientific databases and reference management software (Mendeley/Zotero).
4. Preparation of questionnaires, observation schedules and interview formats for forensic research.
5. Crime scene documentation using photography, sketching and digital recording.
6. Sampling strategies for biological, chemical and physical evidence.
7. Data coding, tabulation and descriptive statistical analysis using MS Excel/SPSS/R.
8. Interpretation of analytical data generated from forensic laboratory reports.
9. Preparation of scientific graphs, tables and data visualization.
10. Plagiarism checking and scientific referencing using APA/Vancouver style.
11. Preparation of scientific posters and oral presentations.
12. Writing a forensic research report/manuscript following standard scientific format.
13. Critical appraisal of published forensic research articles.
14. Seminar presentation and viva voce on a selected forensic research topic.

**Assessment Method-** As per University Guidelines

#### **Suggested Readings**

1. Houck, M.M., & Siegel, J.A. (2024). Fundamentals of Forensic Science (5th ed.). Academic Press.
2. Saferstein, R. (2023). Criminalistics: An Introduction to Forensic Science (13th ed.). Pearson.
3. Robertson, B., & Vignaux, G.A. (2016). Interpreting Evidence: Evaluating Forensic Science in the Courtroom (2nd ed.). Wiley.
4. Curran, J.M., Buckleton, J.S., & Gill, P. (2020). Forensic Interpretation of Glass Evidence. CRC Press.
5. Creswell, J.W., & Creswell, J.D. (2023). Research Design: Qualitative, Quantitative and Mixed Methods Approaches (7th ed.). Sage.
6. Kumar, R. (2020). Research Methodology: A Step-by-Step Guide for Beginners (5th ed.). Sage.
7. ISO/IEC 17025:2017. General Requirements for the Competence of Testing and Calibration Laboratories.
8. Sharma, B.R. (Latest Edition). Forensic Science in Criminal Investigation and Trials. Universal Law Publishing.

## GE-5 FUNDAMENTALS OF NANOTECHNOLOGY

| Paper                          | Total Credit | Lecture | Practical/<br>Practice | Pre-requisite of the course               |
|--------------------------------|--------------|---------|------------------------|-------------------------------------------|
| Fundamentals of Nanotechnology | 04           | 03      | 01                     | Basic knowledge of science and chemistry. |

### Course Outcomes:

1. Explain fundamentals of nanoscience and nanotechnology
2. Understand synthesis and properties of nanomaterials
3. Identify tools used for nanomaterial characterization
4. Apply nanotechnology in forensic investigations

### Learning Objectives:

1. To introduce basic concepts of nanotechnology
2. To understand synthesis and properties of nanomaterials
3. To explore characterization techniques
4. To study applications of nanotechnology in forensic science

### Unit I: Introduction to nanotechnology (12 Hours)

Definition and history of nanotechnology, Nanoscale and its importance, Classification of nanomaterials (0D, 1D, 2D, 3D), Unique properties of nanoparticles: optical, electrical, mechanical, chemical. Surface area to volume ratio and quantum effects. Applications of nanotechnology in general science.

### Unit II: Synthesis of Nanomaterials (11 Hours)

Top-down and bottom-up approaches of Nanoparticle synthesis. Synthesis of nanoparticles by Physical methods (ball milling, lithography), Chemical methods (sol-gel, precipitation, chemical vapor deposition), Biological or green synthesis (plant extracts, microbes). Factors affecting nanoparticle synthesis. Safety and toxicity of nanomaterials.

### Unit III: Characterization Techniques (11 Hours)

Introduction and importance of characterization Microscopy techniques: Scanning Electron Microscope (SEM), Transmission Electron Microscope (TEM), Atomic Force Microscope (AFM). Spectroscopy techniques: UV–Visible Spectroscopy, X-ray Diffraction (XRD), Fourier Transform Infrared Spectroscopy (FTIR). Particle size and surface analysis.

### Unit IV: Forensic Applications of Nanotechnology (11 Hours)

Role of Nanotechnology in crime detection, Fingerprint detection using nanoparticles, Drug and explosive detection, DNA analysis and biosensors, Nanotechnology in toxicology, Future trends and challenges in forensic nanotechnology.

### **Practical's ((30 Hours)**

1. Preparation of simple nanoparticles by biological matrix
2. Study of nanoparticle properties using basic techniques
3. Case studies on forensic applications
4. Visualisation of different types of nanoparticles in microscopy/spectroscopy tools.

**Assessment Method-** As per university guidelines

### **Suggested Readings**

1. Introduction to Nanotechnology by *Charles P. Poole Jr.* and *Frank J. Owens*. Publisher John Wiley & Sons in 2003.
2. *Nanotechnology: Principles and Practices* is a textbook authored by S. K. Kulkarni
3. *Nanotechnology: A Gentle Introduction to the Next Big Idea*, 2002 by physicist Mark A. Ratner and engineer Daniel Ratner.
4. *Forensic Science: An Introduction to Scientific and Investigative Techniques* a comprehensive textbook edited by Stuart H. James.

## GE-6 FORENSIC MEDICINE

| Paper             | Total Credit | Lecture | Practical/ Practice | Pre-requisite of the course         |
|-------------------|--------------|---------|---------------------|-------------------------------------|
| Forensic Medicine | 04           | 03      | 01                  | Basic knowledge of forensic science |

### Course Outcomes:

1. Identify, examine and prepare report or certificate in medico-legal cases/situations in accordance with the law of land.
2. Examination of the death body on hanging, and suicide case.
3. Emerging trend for the investigation of death body for justice.
4. To identify the manner of death.

### Learning Objectives:

After studying this paper, the students will know

1. The duties of the first responding officer who receives a call on homicide or suicide case.
2. The steps involved in processing the death scene.
3. The importance of ascertaining whether the crime was staged to appear as suicide or accident.
4. The importance of bloodstain patterns in reconstructing the crime scene.

### Unit I: Forensic Medicine/Medico legal investigation (12 Hours)

Medical jurisprudence, Objectives of medico legal investigation, Death and its causes, types of death, Signs of death. Post mortem changes: classification, manner of death, Estimation of time since death, Post mortem biochemistry of the body fluids, Modern techniques used for the estimation of time since deaths, exhumation,

### Unit II: Death and its Investigation (11 Hours)

Forensic Entomology: Identification of specific insects and their developmental stages (life cycles), Medico legal importance, Crimes against women Introduction to sexual offences, Natural and unnatural sexual offences, Abortion & Infanticide & SIDS, Deaths from starvation. Classification of asphyxia deaths: Hanging, Strangulation, evidence collection and analysis,

establishing manner of deaths, Suffocation, Drowning and traumatic asphyxia, medico legal importance of diatoms, medico legal importance.

### **Unit III: Medicolegal Aspects of Injuries (11 Hours)**

Mechanical Injuries: Abrasions, Bruises, Lacerations, Incised wounds, Stab wounds, Firearm injuries, Defence injuries, fabricated injuries, vital clues for establishing the manner of deaths due to various injuries, Traffic accident injuries, Thermal injuries, Deaths due to electrocution - lightning, Electricity, Deaths due to explosions, Deaths due to Chemical trauma, Artificial Injuries.

### **Unit IV: Death Investigation (11 Hours)**

Process of investigation and approach of investigator at the scene of death. Dying declaration. Dying deposition. Identifying of possible suspects and their interview. Interview of possible suspects, witnesses, and onlookers. Suspect in custody – initial interrogation and searching for evidence.

### **Practical's (30 Hours)**

Test to differentiate between methanol and ethanol.

1. Extraction of poison by different techniques
2. Postmortem examination in various Asphyxial deaths.
3. Postmortem examination of various homicidal/ accidental injuries.
4. Microscopic Examination of Diatoms.
5. To Study the cases of drowning
6. To study the Cases of hanging

**Assessment Method-** As per University Guidelines

### **Suggested Readings**

1. Sharma, B.R.; “Forensic Science in Criminal Investigation & Trials”, Universal Publishing Co., New Delhi,
2. Chadha, PV; “Handbook of Forensic Medicine & Toxicology”, Jaypee Brothers, New Delhi,
3. O’Hara CE and Osterburg, JW; “An Introduction to Criminalistics”, Indiana Univ. Press, London,
4. J. Dix, Handbook for Death Scene Investigations, CRC Press, Boca Raton.
5. H.B. Baldwin and C.P. May in, Encyclopedia in Forensic Science Volume 1, J.A. Siegel, P.J. Saukko and G.C. Knupfer (Eds.), Academic Press, London.
6. V.J. Geberth, Practical Homicide Investigation, CRC Press, Boca Raton.

## DISSERTATION: ON ANY SPECIALIZED FIELD OF FORENSIC SCIENCE

| Paper                                                                     | Total Credit | Lecture | Practical/ Practice | Pre-requisite of the course |
|---------------------------------------------------------------------------|--------------|---------|---------------------|-----------------------------|
| DISSERTATION:<br>ON ANY<br>SPECIALIZED<br>FIELD OF<br>FORENSIC<br>SCIENCE | 06           | 00      | 06                  | NIL                         |

**Course Outcomes:** The Dissertation aims to provide students with an opportunity to undertake independent research in a specialized area of forensic science. The course is designed to develop scientific inquiry, critical thinking, problem-solving abilities, and research ethics through the application of theoretical knowledge to practical forensic problems. Students will gain experience in research planning, experimental design, data collection, analysis, interpretation, scientific writing, and presentation while working under the guidance of a faculty supervisor. The project also seeks to enhance laboratory competence, familiarize students with contemporary forensic techniques and instrumentation, and prepare them for professional careers in forensic science, research, and academia.

### Learning Objectives

- Identify and formulate a research problem relevant to forensic science.
- Conduct a comprehensive review of scientific literature and identify research gaps.
- Design and execute experimental studies using appropriate forensic methodologies.
- Apply laboratory techniques, analytical instruments, and statistical tools for data collection and analysis.
- Interpret experimental findings critically and draw scientifically valid conclusions.
- Demonstrate adherence to research ethics, laboratory safety, and quality assurance practices.
- Prepare a scientific dissertation following standard academic and research guidelines.
- Communicate research findings effectively through oral presentations, seminars, and viva-voce examinations.

### Dissertation Guidelines:

The Dissertation shall be undertaken individually by each student under the supervision of a faculty member of the Department.

The research topic should be selected from any specialized area of forensic science, including but not limited to forensic biology, forensic chemistry, forensic toxicology, forensic anthropology,

questioned documents, fingerprint science, digital forensics, crime scene investigation, forensic psychology, forensic medicine, forensic ballistics, forensic entomology, forensic nanotechnology, environmental forensics, wildlife forensics, or other emerging areas.

Students shall prepare a research proposal containing the title, objectives, literature review, research methodology, expected outcomes, and timeline of work. The proposal shall be approved before commencement of experimental work.

The dissertation shall involve literature review, experimental investigation and/or field study, data analysis, interpretation of results, and preparation of a dissertation. Students are expected to maintain a project diary/laboratory record documenting experimental procedures, observations, and progress throughout the project period.