



List of New Course(s) Introduced

Department : Forensic Science

Programme Name : M.Sc.

Academic Year : 2021-22

List of New Course(s) Introduced

| Sr. No. | Course Code | Name of the Course |
|---------|-------------|---|
| 01. | FSPBTD1 | Forensic Psychiatry |
| 02. | FSPBTD2 | Wildlife Forensic and Forensic Entomology |
| 03. | FSPBLD1 | Practical's based on Forensic Psychiatry |
| 04. | FSPBLD1 | Practical's based on Wildlife Forensic and Forensic Entomology |
| 05. | FSPCTD1 | Forensic Genomics, Proteomics and Bioinformatics |
| 06. | FSPCTD2 | Forensic Microbiology and Immunology |
| 07. | FSPCLD1 | Practical's based on Forensic Genomics, Proteomics and Bioinformatics |
| 08. | FSPCLD2 | Practical's based on Forensic Microbiology and Immunology |
| 09. | FSPCTO1 | Modern Advances in Drug Of Abuse |
| 10. | FSPDTT3 | Nano Forensic |



Minutes of Meetings (MoM) of Board of Studies (BoS)

Academic Year: **2021-22**

School : *School of Studies of Interdisciplinary Education and Research*

Department : *Forensic Science*

Date and Time : *March 23, 2022 - 07:00 PM*

Venue : *On Google Meet Platform*

The scheduled meeting of member of Board of Studies (BoS) of Department of Forensic Science, School of Studies of Interdisciplinary Education & Research, Guru Ghasidas Vishwavidyalaya, Bilaspur was held to design and discuss the syllabus of 3-year UG Program as per CBCS scheme and syllabi.

The following members were present in the meeting:

1. Prof. Mitashree Mitra (External Expert Member BoS, Dept. of. Forensic Science Pt. Ravi Shankar Shula University Raipur)
2. Dr. Sudhir Yadav (HOD, Dept. of Forensic Science-cum Chairman, BOS)
3. Dr. Ajay Amit (Invited Member BoS, Dept. of Forensic Science)
4. Dr. Chanchal Kumar (Invited Member BoS, Dept. of Forensic Science)
5. Miss. Blessi N. Uikey (Invited Member BoS, Dept. of Forensic Science)

Following points were discussed during the meeting

- ❖ It was unanimously resolved that for the skill development of the students, a paper on internship/Apprentice/Training/Industrial training and/or Visit program (2 credits) for 3-4 weeks be included in B.Sc. IVth and M.Sc. IInd semester. Students will do this after the end of respective examination i.e., during summer vacation of the university from the academic session 2021-22
- ❖ To approve minor change in the syllabus of Undergraduate course of Forensic Science, Paper SEC of semester 3rd (LS/FSC/SEC/301-L & LS/FSC/SEC/301-P) and IVth (LS/FSC/SEC/402-L LS/FSC/SEC/402-P) of B.Sc. Homs. N Forensic Science.
- ❖ To discuss and approve the draft of the syllabus and Examination scheme of M.Sc. Forensic Science in accordance to CBXS from the academic session 2021-22.
To approve Pre-Ph.D. course work syllabus and scheme of examination of department of Forensic Science for the implementation from the academic session 2021-22.



❖ To discuss learning outcome-based curriculum frame work

The committee discussed and approved the scheme and syllabi. The following courses were newly introduced in the of M.Sc. Course in first year (1st and 2nd year):

- ❖ FSPBTD1 Forensic Psychiatry
- ❖ FSPBTD2 Wildlife Forensic and Forensic Entomology
- ❖ FSPBLD1 Practical's based on Forensic Psychiatry
- ❖ FSPBLD1 Practical's based on Wildlife Forensic and Forensic Entomology
- ❖ FSPCTD1 Forensic Genomics, Proteomics and Bioinformatics
- ❖ FSPCTD2 Forensic Microbiology and Immunology
- ❖ FSPCLD1 Practical's based on Forensic Genomics, Proteomics and Bioinformatics
- ❖ FSPCLD2 Practical's based on Forensic Microbiology and Immunology
- ❖ FSPCTO1 Modern Advances in Drug of Abuse
- ❖ FSPDTT3 Nano Forensic

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Scheme and Syllabus

PG COURSE IN FORENSIC SCIENCE (TWO YEARS / FOUR SEMESTERS)

| | | M.Sc.1 st semester | | Hours/ week | Credit |
|-------------------------------|----------------|------------------------------------|---|----------------|-----------|
| M.Sc.1 st semester | Core -1 | FSPATT1 | Forensic Science & Criminology | 3 | 3 |
| | Core -2 | FSPATT2 | Crime Scene management | 3 | 3 |
| | Core -3 | FSPATT3 | Instrumental analysis in Forensic sciences | 3 | 3 |
| | Core -4 | FSPATT4 | Forensic Biology and Serology | 3 | 3 |
| | Lab -1 | FSPALT1 | Practical's Based on Crime Scene management | 6 | 3 |
| | Lab -2 | FSPALT2 | Practical's Based on Forensic Biology and Serology | 6 | 3 |
| | | FSPAST1 | Seminar | 2 | 2 |
| | | | Total credits | | 20 |
| M.Sc.2 nd semester | Core -5 | FSPBTT1 | Questioned Documents and Fingerprints | 3 | 3 |
| | Core -6 | FSPBTT2 | Forensic Genetics and DNA Profiling | 3 | 3 |
| | Core -7 | FSPBTT3 | Forensic Chemistry and Toxicology | 3 | 3 |
| | Core -8 | FSPBTT4 | Research Methodology and Ethics | 3 | 3 |
| | Elective- 1* | FSPBTD1 | Forensic Psychiatry | 3 | 3 |
| | Elective- 2* | FSPBTD2 | Wildlife Forensics AND Forensic Entomology | | |
| | Lab -3 | FSPBLT1 | Practical's Based on Forensic Genetics and DNA Profiling | 6 | 3 |
| | Lab -4 | FSPBLT2 | Practical's Based on Forensic Chemistry and Toxicology | 6 | 3 |
| | Lab -5 | FSPBLD1 | Practical's Based on Forensic Psychiatry | 6 | 3 |
| | Lab -6 | FSPBLD2 | Practical's Based on Wildlife Forensics and Forensic Entomology | | |
| | | FSPBST1 | Seminar | 2 | 2 |
| | | Summer / Field Industrial Training | -- | 2 | |
| | | Total Credits | | 26+2 | |
| M.Sc.3 rd semester | Core -9 | FSPCTT1 | Computer Forensics and Digital investigations | 3 | 3 |
| | Core -10 | FSPCTT2 | Forensic Ballistics and Physics | 3 | 3 |
| | Core -11 | FSPCTT3 | Forensic Medicine | 3 | 3 |
| | Core -12 | FSPCTT4 | Forensic Anthropology | 3 | 3 |
| | Elective - 3** | FSPCTD1 | Forensic Geriatrics, Proteomics and Bioproteomics | 2 | 2 |
| | Elective - 4** | FSPCTD2 | Forensic Microbiology and Immunology | 2 | 2 |


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| | | | | | | |
|--------------------------------|------------------|----------------|---|--|-----------|---|
| M.Sc. 4 th Semester | Lab-7 | FSPCLT1 | Practical's Based on Computer Forensics and Digital investigations | 6 | 3 | |
| | Lab-8 | FSPCLT2 | Practical's Based on Forensic Ballistics and Physics | 6 | 3 | |
| | Lab-9 | FSPCLD1 | Practical's Based on Forensic Genomics, Proteomics and Bioinformatics | 6 | 3 | |
| | Lab-10 | FSPCLD2 | Practical's Based on Forensic Microbiology and Immunology | | | |
| | Open Elective | FSPCTO1 | Modern advances in Drugs of abuse | 2 | 2 | |
| | | FSPCST1 | Seminar | | 2 | |
| | | | Total Credits | | 27 | |
| | | Elective- 5*** | FSPDTT1 | Recent Advancement in Forensic Chemistry | 3 | 3 |
| | | Elective- 6*** | FSPDTT2 | Recent Advancement in Forensic Toxicology and Pharmacology | 3 | 3 |
| | | Elective- 7*** | FSPDTT3 | Nano Forensics | 3 | 3 |
| | Elective- 8*** | FSPDTT4 | Recent Advancement in Forensic Physics | 3 | 3 | |
| | Elective- 9*** | FSPDTT5 | Recent Advancement in Forensic Ballistics | 3 | 3 | |
| | Elective- 10*** | FSPDTT6 | Recent Advancement in Questioned Documents and Fingerprints | 3 | 3 | |
| | Elective- 11*** | FSPDTT7 | Recent Advancement in Forensic Photography | 3 | 3 | |
| | Elective- 12 *** | FSPDTT8 | Recent Advancement in Forensic Biology | 3 | 3 | |
| | Elective- 13*** | FSPDTT9 | Recent Advancement in Forensic Serology & Immunology | 3 | 3 | |
| | | FSPDDT1 | Dissertation | | 12 | |
| | | | Total Credits | | 15 | |
| | | | Overall Credits | | 90 | |

*Students can opt any one Elective paper.

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M.Sc. Forensic Science
Semester - II ESPB1D1
Forensic Psychiatry
(Elective-I)

Maximum Marks: 100

Allotted credits: 03

Introduction to forensic Psychology. Historical Perspective - Indian and Global concern, Roles of Forensic psychology and forensic Psychologist, Introduction to crime, elements of crime, Modus Operandi, Classification of Crime, Types of Crime- Economic crime, organized crime, white collar crime, Crime against women, Juvenile delinquency etc.

UNIT II-

Theories of criminal offences -Theories of Criminal behavior- Biological, Physiological, Economical, Sociological, etc. Theories of punishment (Deterrent, Retributive and Reformative) Criminal profiling, Deductive and Inductive Profiling.

UNIT III -

Legal Aspect in Forensic Psychology, Mental Health Act 1987, Human Rights of mentally ill person, Competency to stand trial, insanity defence, relevant sections of IPC, Correctional measures- rehabilitation of mentally ill, correctional home.

UNIT IV-

Assessment and Evaluation- Clinical Interviews, Mental status Examination, Psychological test, personality test, Intelligence test, Aptitude test etc. Therapeutic approaches - type of therapies (cognitive behavioural therapy ,Psychodynamic, Humanistic etc)Tools used in Forensic Psychology- Polygraph , Narco-analysis, Brain mapping, Hypnosis, Psychological autopsy

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M.Sc. Forensic Science
Semester –II FSPBLD1
Practicals based on Forensic Psychiatry
(Lab-5)

Maximum Marks: 100

Allotted credits: 03

1. To cite a criminal case in which narco analysis was used as a means to detect deception.
2. To review a crime case involving serial murders. Comment on the psychological traits of the accused.
3. To study a criminal case in which hypnosis was used as a means to detect deception.
4. Assessment of intelligence through inventories.
5. Assessment of mental status through interviews.
6. Assessment of personality using EPI.
7. Assessment of personality using MMPI.
8. To prepare a report on relationship between mental disorders and forensic psychology.

Course Outcome: By the end of this course student will know about basics of forensic psychology and its application the court of law. They will also know about various tests performed for assessment and evaluation of mental status.

Learning Outcomes:

1. The students will able to learn about basics of crime, their element and classification.
2. They will know about various theories of criminal offences.
3. They will also know about legal aspects of forensic psychology.
4. They will learn about various tests performed for the evaluation and assessment of mental status of a criminal.

Suggested Readings

1. A.A. Moenssens, J. Starrs, C.E. Henderson and F.E. Inbau, Scientific Evidence in Civil and Criminal Cases, 4th Edition, The Foundation Press, Inc., New York (1995).
2. R. Saferstein, Criminalistics, 8th Edition, Prentice Hall, New Jersey (2004).

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M.Sc. Forensic Science
Semester - II FSPB1D2
Wildlife Forensics and Forensic Entomology
(Elective-2)

Maximum Marks: 100

Allotted credits: 03

Unit I

Wildlife ecology, Definition of wildlife, free living, domestic, captive and feral animals, wildlife conservation and its importance, Zoographic regions and biomes of India, Uniqueness of Indian biodiversity, reason and causes of wildlife depletion, rare, threatened and endangered species of India.

Unit II

Introduction to Wildlife Crimes and its types, Investigation of a wildlife crime scene, Different methods of killing and poaching of wildlife animals, Techniques of Species identification, types of wildlife evidences, wildlife artefacts, tools and techniques of wildlife crime investigation.

Unit III

Illegal wildlife trade, Identification of pug marks of different animals, Wildlife Protection Act, 1972, Introduction to Wildlife conservation agencies-WWF, IUCN, CITES, WCCB, Wildlife conservation society, Defenders of Wildlife, Biglite Foundation, International fund for Animal welfare, National wildlife federation, Red Data Book, TRAFFIC.

Unit IV

Definition, nature and scope of Forensic entomology Types of forensic insects, collection of entomological evidence, Insect succession, molecular methods for forensic entomology. Life cycle of Insects.

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M.Sc. Forensic Science
Semester -II ESPBLD2

Practicals based on Wildlife Forensics and Entomology
(Lab-6)

Maximum Marks: 100

Allotted credits: 03

1. To perform collection and preservation of entomological evidence
2. To study the lifecycle of different insect families.
3. To perform microscopic examination of hair of wildlife species.
4. To prepare the report of wildlife crime investigation.
5. To study the cases related to wildlife crimes in Indian scenario.

Course Outcome: By the end of this course students will have basic knowledge of wildlife and their application in the field of Forensic Science.

Learning Outcomes:

1. The students will learn about wildlife ecology, their conservation and their importance.
2. They will know about wildlife crimes and the investigation of wildlife crime scene.
3. They will learn about illegal trading and poaching of wild flora and fauna.
4. They will also have knowledge of various insects and their forensic application.

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M.Sc. Forensic Science

Semester - III FSPC TDI

Forensic Genomics, Proteomics and Bioinformatics
(Elective- 3)

Maximum Marks: 100

Allotted Credits: 02

UNIT-I: Human Genome organization

Human genome: Genome project history, organization and goals of human genome project, Mapping strategies, DNA segment nomenclature, Human genome diversity, organization of human genome, Comparative genomics: Overview of prokaryotic and eukaryotic genomes, C-value, number of genes and complexity of genomes, Conservation and diversity of genomes, Comparative genomics as an aid to gene mapping and study of human disease genes.

UNIT-II: Genome analysis

Structure and organization of eukaryotic genomes- nuclear and mitochondrial; Computational analysis, Databases, Finding STR markers; Tools for genome analysis- PCR, RFLP, DNA fingerprinting, RAPD, SNP detection, SSCP, FISH to identify chromosome landmarks; Human Genome mapping methods, BAC libraries and shotgun libraries preparation, Physical map, Cytogenetic map, Contig map, Restriction map, UCSC browser.

UNIT-III: Recent advances in genome sequencing

Experimental protocol (Isolation of DNA/RNA), Introduction to sequencing, Maxam and Gilbert method, Sanger Sequencing techniques and applications; Next Generation sequencing (NGS), Introduction to NGS, quality check, Library Preparations, sequencing reaction); Platform overview (Illumina, 454 (Roche), SOLiD (Life technology), Ion Torrent, Nanopore, PacBio, Types of NGS, DNA-sequencing - Whole genome sequencing, exome sequencing, Deep sequencing, Data Processing and Analysis: Data Quality Check, filtering and Genome assembly and mapping to reference genomes, mapping tools (bowtie, maqetc.), Sequence Alignment formats: Sequence Alignment/Map (SAM) format, Binary Alignment/Map (BAM) format, Application of different sequencing technique, DNA sequence analyser

UNIT-IV: Proteomics

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Overview of protein structure-primary, secondary, tertiary and quaternary structure, Relationship between protein structure and function; Outline of a typical proteomics experiment, Identification and analysis of proteins by 2D analysis, Spot visualization and picking; Tryptic digestion of protein and peptide fingerprinting, Mass spectrometry : ion source (MALDI, spray sources), analyzer (ToF, quadrupole, quadruple ion trap) and detector; Post translational Modifications: Quantitative proteomics, clinical proteomics and disease biomarkers, far western analysis, surface plasmon resonance technique; Protein interaction maps, Protein arrays-definition; applications- diagnostics, expression profiling. Human forensic proteome, Non-traditional Forensics, Proteomics for microbial forensic.

Learning outcome:

1. Students will learn about genome content, complexity and its organization.
2. They will learn about tools used in genome mapping, analysis and modern genome sequencing techniques and its applications.
3. They will learn about protein structure, composition and instrumental analysis methods in forensic science.
4. In practical aspects they will be able to learn about molecular biology techniques used for analysis of forensic DNA and proteins.

Recommended text book and Reference books reading

1. Brown TA (2006) *Genomes*, 3rd Edition, Garland Science.
2. Campbell AM and Heyer LJ (2007) *Discovering Genomics, Proteomics and Bioinformatics*. Benjamin Cummings.
3. Primrose S and Twyman R (2006) *Principles of Gene Manipulation and Genomics*, 7th Edition, Blackwell.
4. Rehm H (2006) *Protein Biochemistry and Proteomics*, 4th Edition, Academic Press.
5. Twyman RM. (2013) *Principles of Proteomics*, Second Edition by Garland Science Taylor & Francis Group New York and London.
6. Liebler DC (2002) *Introduction to Proteomics: Tools for the New Biology*, Humana Press, Totowa NJ. USA.

 


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M.Sc. Forensic Science

Semester - III FSPCTD2

Forensic Microbiology and Immunology

(Elective-4)

Maximum Marks: 100

Allotted Credits: 02

Unit I: Introduction to Forensic Microbiology: Microbes and Forensic Science: General characteristic of Virus, Bacteria and fungus (Morphology, Nutrition, reproduction & economic importance). Bacteria of Forensic importance. Fungi of forensic importance, Anti-bacterial & Antifungal agents. Forensic Aspects of Biological Toxins. Forensic Analysis of Trace and Unculturable Specimens etc.

Unit II: Applied Forensic Microbiology: Biological agents in warfare: Collection, transportation and preservation of microbial forensic samples, Sterilization (Physical & Chemical) Categories of biological weapons; Toxins and their mode of action & identification, laboratory setup, epidemiologic investigation for public health, investigation of suspicious disease outbreak; Biosafety and biosecurity, Bio-surveillance documentation and case studies.

Unit III: Introductory Immunology: Introduction to Immune system: Cells and organs of Immune system. Innate immunity: Complement system, phagocytosis, extravasation, Toll like receptors, Host-microbe interaction, Acquired Immunity: B-cell and T-cell proliferation and maturation, Major Histo-compatibility complex (MHC-I & MHC-II), Antigen presentation, Hypersensitivity, Immunization. [8]

Unit IV: Applied Immunology: Immunological communication and immunological receptors, Immunological mediators, Humoral & Cell mediated Immunity, Hybridoma technology and monoclonal antibodies. Animal cell culture for immunological research (Cell line, Culture media, Culturing technique & aseptic condition). Scope in forensic immunology, Toxin & drug mediated immune-modulation, Animal model for forensic immunological research. ELISA, Western Blotting, Flow Cytometry.] 10

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M.Sc. Forensic Science

Semester -III

ESPCLD2

Practicals based on Forensic Microbiology and Immunology.
(Lab-10)

Maximum Marks: 100

Allotted credits: 03

1. Hand on practices of sterilization techniques.
2. Culture Media preparation and sterilization.
3. Four Flame streaking techniques.
4. Bacterial Culture.
5. MTT based toxicity assay.
6. Single and double immunodiffusion.
7. ELISA.
8. Animal Cell Culture.

Course Outcome:

This course will provide students with an overview of basic of Microbiology and Immunology in respect to forensic science.

Student Learning Outcomes:

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

1. Understand the types, nature and importance of microbes.
2. Understand application of microbes in forensic investigation.
3. Understand basics of various aspects of human immunology.
4. Understands the practical application of immunology in development of forensic investigation.

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Recommended text book and Reference books reading

- 1 Kindt, T. J., Goldsby, R. A., Osborne, B. A., & Kuby, J. (2006) *Kuby Immunology* New York: W H. Freeman.
- 2 Paul, W. E. (1993) *Fundamental Immunology* New York: Raven Press
- 3 AK Abbas, (2015), *Cellular and Molecular Immunology* 8th Edition, Elsevier
- 4 Ananthanarayan and Paniker, *Textbook of Microbiology*, 8th Edition.
- 5 Baveja CP, (2001) *Textbook of Microbiology* 5th Ed., McGraw Hill Education.

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M. Sc. in Forensic Science

Semester-III FSPCTO1

Modern advances in Drugs of abuse

(Open elective paper)

Maximum Marks: 100

credits:02

UNIT-I: Introduction to Drugs and its abuse

Definition and Concept of drug abuse, what constitute drug abuse? Prevalence of drug abuse, Difference between drug abuse, drug dependence and drug addiction, Concept of drug tolerance, Physical and psychological dependency.

UNIT-II: Classification of abused drugs

Classification of abused drugs, Stimulant: Amphetamines, Cocaine, Nicotine, Depressants: Alcohol, Barbiturates- Nembutal, Seconal, Phenobarbital Benzodiazepines -Diazepam, Alprazolam, Flunitrazepam, Narcotics: Opium, morphine, heroin, Hallucinogens: Cannabis & derivatives (marijuana, hashish, hash oil), Steroids, Inhalants

UNIT-III: Scope of drug testing and relevant acts

Drug and cosmetics act 1940, NDPS act, other relevant sections in IPC, prevention of substance abuse, substance use disorder and its treatment, Sports doping, Workplace testing

UNIT-IV: Identification methods of abused drugs

Methods of sample collection, Type of sample: blood, urine, saliva, hair, sweat, breast milk, semen and nails; Abused drugs detection methods: Presumptive tests, color test, immunoassays: Enzyme multiplied immunoassay technique (EMIT), Fluorescence polarization immunoassay (FPIA), Cloned Enzyme donor assay (CEDA), Radioimmunoassay (RIA), Enzyme-linked immune assay (ELISA), Lateral Flow Assay (LFA); Chromatographic techniques: TLC, HPLC, GC; Mass spectrometry: LC-MS, GC-MS; Electrophoretic technique;

Course Outcomes: By the end of this course students will know about various drugs and their abuse. They will also know about various identification methods of abused drugs.

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Learning Outcomes:

1. Students will learn about the concept of drug abuse and its physical and psychological dependency.
2. They will know about various classified drugs in detail.
3. They will learn about scope of drug testing and relevant acts of IPC, NDPS, drugs and cosmetics acts etc.
4. They will also learn about various analytical methods used for the identification of abused drugs.

Recommended text book and Reference books reading

1. A. Musah (2018) Analysis of Drugs of Abuse, Humana Press, New York, NY.
2. Steven B. Karch (2006) Drug abuse Handbook 2nd edi., CRC Press Taylor & Francis
3. Carl Hart and Charles Ksir (2014) Drugs, Society, and Human Behavior, 17th Edition, McGraw-Hill Education, 2 Penn Plaza, New York, NY.
4. Raphael C. Wong, Harley Y. Tse (2006) Drugs of Abuse: Body Fluid Testing, Humana Press Inc., Totowa, New Jersey
5. Frederick P. Smith, Jay A. Siegel Handbook of Forensic Drug Analysis (2005), Elsevier Academic Press, London, UK


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M. Sc. in Forensic Science

Semester – IV

FSPDTT3

Nano Forensics

(Elective-7)

Maximum Marks: 100

Allotted credits: 03

UNIT-1: Basics of nanotechnology

The role of proteins- amino acids- nucleic acids- lipids and polysaccharides in modern biomaterials. Overview of natural Bio nanomachines: Thymidylate Synthetase, ATP synthetase, Actin and myosin, Opsin, Antibodies and Collagen, basics of nonmarital synthesis, principal of microfluidics, quantum dots, Electrochemical sensors, development of DNA aptamer sensors, optical sensors, colorimetric sensors

UNIT-2: Methods for nanomaterials characterization

Introduction, Structural Characterization, X-ray diffraction (XRD), Scanning electron, microscopy (SEM), Transmission electron microscopy (TEM), Scanning probe microscopy (SPM). Chemical Characterization, Isothermal chemistry titration (ICT), Surface Plasma Resonance, Circular dichroism, Physical Properties: Thermal stability and lattice constant, Mechanical properties, Optical properties, Electrical conductivity, Ferroelectrics and dielectrics, Superparamagnetic, Emission spectroscopy, luminescence spectroscopy, Raman spectroscopy.

UNIT-3: Biosensors in Forensic Science

Device for testing in Forensic Science laboratory, Device for drug of abused testing, Device for testing of explosive content, development of sensors based of Lateral Flow, immunoassays based on nanomaterials, biosensors-based methods used for detection of latent fingerprints, pesticides, toxins, venom etc.

UNIT-4: Application of protein and DNA based nanostructures in Forensics

DNA Aptamer technology and its application in forensics. Protein based nanostructures building blocks and templates – Proteins as transducers and amplifiers of biomolecular

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recognition events. DNA based nanostructures– Topographic and Electrostatic properties of DNA and proteins – Hybrid conjugates of gold nanoparticles – DNA oligomers

Learning Outcomes:

1. Students will able to understand the basic knowledge of nanomaterial and nanotechnology.
2. They will able to understand the methods used for nanomaterial characterization.
3. They will also learn basic concepts of sensors-based devices.
4. They will also learn the application of protein and DNA based sensors in forensic sciences.

Recommended Reading:

1. Niemeyer.C.M. Mirkin C. A "Nanobiotechnology: Concepts, Applications and Perspectives", Wiley – VCH, 2004
2. Challa. S.S.R. Kumar. Josef Hormes, Carola Leuschaer." Nanofabrication Towards Biomedical Applications, Techniques, Tools, Applications and Impact", Wiley – VCH, 2005.
3. Nicholas. A, Kotov. "Nanoparticle Assemblies and Superstructures", CRC, 2006.
4. David. S, Goodsell. "Bionanotechnology", John Wiley & Sons, 2004
5. Surface Plasmon Resonance Based Sensors in Springer Series on Chemical Sensors and Biosensors; Volume Four; Ed.Jiri Homola; Springer, Berlin; 2006
6. Biosensors and modern biospecific analytical techniques. Volume 44 of Wilson & Wilson's Comprehensive Analytical Chemistry; Ed. L Gorton; Elsevier, Amsterdam, London; 2005
7. The Immunoassay Handbook; Ed. David Wild; 3rd ed.; Amsterdam: Elsevier; 2005 11.
8. Alternative Immunoassays; Ed. W P Collins; Chichester: Wiley; 1985
9. Electrochemical Methods: Fundamentals and Applications; Allen J Bard and Larry R Faulkner; Wiley, New York, Chichester: 2nd ed.; 2001

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