

File no. NFSU/HRM/J-211/2024

Date- 09/09/2024

**Notice**

Subject – Process of Selection, Scheme of Examination, Syllabus, Pattern of  
Written Examination and Selection Criteria for the Posts of Junior  
Scientific Officer and Senior Scientific Assistant

Ref. – Advt. No. NFSU/Scientific Posts/02/2024 dated 14<sup>th</sup> March, 2024

In Pursuance of the clause no: 15 of the advertisement referred above published for Scientific Posts (Junior Scientific Officer and Senior Scientific Assistant) in the month of March 2024, the Process of Selection, Scheme of Examination, Syllabus, Pattern of Written Examination and Selection Criteria is placed here under for the information of all concerned. The other details about the further process will be notified on the University website or will be shared on registered email id of the candidate in due course of time.

  
Dy. Registrar (HRM)

Copy to,  
Executive Registrar, NFSU

**Scheme of Examination, Pattern, Method of Selection and Syllabus for the posts of Junior Scientific Officer (Pay Level -7) and Senior Scientific Assistant (Pay Level -6) in various disciplines advertised vide advt. No. NFSU/Scientific Posts/02/2024 date 14<sup>th</sup> March, 2024.**

The following Scheme of Examination is decided:

1	2	3	4
<b>Paper 1</b>	<b>Written Test</b>	MCQ – 100 Time-90 minutes Marks – 100 (There will be 25 MCQ from Part –A and 75 MCQ from Part -B).	<b>Part –A:</b> Mental Ability Test consisting of <ul style="list-style-type: none"> <li>• Reasoning,</li> <li>• Arithmetic,</li> <li>• English Language</li> <li>• General Science.</li> </ul> <b>Part –B:</b> As per the core syllabus prescribed for the post. (The syllabus is enclosed herewith)
	<b>Notes:</b> <ul style="list-style-type: none"> <li>➤ 10 candidates will be short listed against each post based on interse merit list. (On the basis of marks obtained by the candidate in <b>Paper –1</b>.</li> <li>➤ In case of the same marks of the last candidate, all the candidates having the same marks will also be shortlisted for <b>Paper -2</b>.</li> <li>➤ Only the short listed candidates as above will be allowed to undertake the <b>Skill Test (Paper 2)</b></li> </ul>		
<b>Paper 2</b>	<b>Skill Test</b>	<b>100 Marks</b>	As per the requirement of particular post(s).
	<ul style="list-style-type: none"> <li>➤ For preparation of final merit, the Paper –2 will carry 75% Weightage and Paper -1 will carry Weightage of 25%.</li> <li>➤ The final selection to the post will be made based on the combined score of Paper 1 and Paper 2 subject to other conditions related to essential eligibility for the concerned post as well as successful verification of the original documents.</li> </ul>		

<b>Name of Post</b>	Junior Scientific Officer (Cyber Security)
<b>Pay Level</b>	Level - 7
<b>Pay Scale</b>	(44900 - 142400)
<b>Medium</b>	English
<b>Syllabus</b>	Unit - 1 Fundamentals of IT/ICT: Computer and Its Components, Computer Hardware and Software, Basics of Operating System, Networking Concepts, Fundamentals of Programming, Understanding of Various Filesystems, cyber attacks and types. (10%)
	Unit - 2 Cyber Security: OS Security, Network Security, Application Security, Database Security, Vulnerability Assessment and Penetration Security, Fundamentals of Malware Analysis, OS Hardening, Log Analysis, Security Information and Event Management (SIEM), Exploits, Threat Intelligence, OSINT, Basics of SOC / NOC, Introduction to CSIRT / CERT, BCP, Concepts of 5G Security, Critical Infrastructure framework, Security, Protocols and Security Assessment (30%)
	Unit - 3 Compliance, Regulations, SoPs and Legal Aspects: ISO 27001 and other accreditation standards of Cyber Security, Security Audits and Compliance, Cyber Laws, Important Sections and Subsection of Existing Laws and New Laws, Incident Response Management (25%)
	Unit - 4 Emerging Trends in Cyber Security: Role of Artificial Intelligence, Blockchain, IoT and other technologies in implementing Cyber Security. Securing Industrial IoT \, Computer Forensics, Mobile Forensics, File Systems, Operating System, Partition Recovery, MBR, GPT, JTAG, Chipoff, Standard Operating Procedures in Digital Forensics, Impact of DPDPA on IT Act, Understanding of New Laws (Bhartiya Sakshya Sanhita, Bharatiya Nyay Sanhita, Bharatiya Nagarik Suraksha), Examiner of Electronic Evidences. (25%)
	Unit - 5 Logical Reasoning, Communication and Analytical Skills (10%)





<b>Name of Post</b>	Junior Scientific Officer (Digital Forensics)
<b>Pay Level</b>	Level - 7
<b>Pay Scale</b>	(44900 - 142400)
<b>Medium</b>	English
<b>Syllabus</b>	Unit - 1 Fundamentals of Digital Technology: Computer and Its Components, Computer Hardware and Software, Basics of Operating System, Networking Concepts, Fundamentals of Programming, Understanding of Various Filesystems. (10%)
	Unit - 2 Digital Forensics and Cyber Crime Investigations: Cyber Crime Scene and Electronic Evidence Management (including hashing, chain of custody, and others), Principle of Digital Forensic Investigations, Branches of Digital Forensics, Windows Forensics, Linux and MAC Forensics, Network Forensics, Memory Forensics, Multimedia Forensics (35%)
	Unit - 3 Compliance, Regulations, SoPs and Legal Aspects: ISO 17025:2017 and various accreditation standards of Digital Forensic Laboratories including 79A, Cyber Laws, Important Sections and Subsection of Existing Laws and Newly Introduced Laws, SoPs for Acquiring, Handling and Preserving Digital Evidences, Best Practices in Digital Forensics, International Guidelines and Compliances (20%)
	Unit - 4 Emerging Trends in Advanced Digital Forensics: Solving Cases related to Advance Technology like IoT, Blockchain, Drone, Artificial Intelligence, Deep/Dark web, OSINT and social media investigation, Cryptocurrencies, Cloud, Fake News, Metaverse, Unknown Devices / Operating Systems, Deepfake audio and video analysis. (25%)
	Unit - 5 Logical Reasoning, Communication and Analytical Skills (10%)



**Syllabus for the Preliminary Test for the recruitment of JSO/SSA for Center of Excellence in DNA Forensics, NFSU, Gandhinagar**

**1. Fundamentals of Forensic Biology**

Definition and scope of forensic biology, Historical development and evolution of forensic biology, Different domains of forensic biology, Types of biological evidence, Importance of biological evidence in forensic investigation, Procedure for Collection, Preservation, packing, sealing, and forwarding of biological samples.

**2. Cell Biology and Basic Biochemistry**

Structure and function of cell and cellular organelles, Amino acids: structure and functional group properties. Composition of proteins, Primary, Secondary and Tertiary structure of protein. Definition, biological importance, classification and chemistry of Carbohydrates and Lipids. Structure and functions of nucleic acids (DNA and RNA). Overview of DNA Replication, Transcription, and Translation. Basics of pH and Buffer. Principles and application of centrifugation techniques.

**3. Forensic Serology**

Blood and its composition, Haemoglobin and its variants, Theories and biochemical tests for the identification of blood, Blood Typing/Grouping : 'ABO' system and its significance in forensic investigation, Other blood group antigens: 'Rh sub types', MN, I, P, Kell, Duffy, Kidd, Lewis, Lutheran and Bombay blood group, Forensic examination and biochemical tests for the identification of semen and other body fluids: vomit, faeces, urine, saliva, and vaginal secretions. Technological advancements in Forensic serology

**4. Microscopy**

Introduction to principles, working and application of Compound Microscope, Stereo Microscope, Comparison Microscope, Phase Contrast Microscope, Fluorescence Microscope and Electron Microscope.

**5. Biostatistics**

Definition and scope of biostatistics, Importance of statistical methods in biological and health sciences. Descriptive Statistics: Measures of central tendency (mean, median, mode). Measures of dispersion (range, variance, standard deviation). Frequency distributions and graphical representation of data. Probability and Probability Distributions: Basic concepts of probability. Probability distributions (binomial, Poisson, normal). Probability rules and Bayes' theorem. Inferential Statistics: Hypothesis testing, Confidence intervals, Type I and Type II errors. Parametric and Nonparametric Tests: t-tests (one-sample, two-sample), Analysis of variance (ANOVA), Chi-square tests. Nonparametric tests (Wilcoxon rank-sum, Kruskal-Wallis). Factorial Component Analysis and Principle Component Analysis.

**6. Molecular Biology Techniques**

Techniques of DNA extraction, Agarose Gel Electrophoresis, Polyacrylamide Gel Electrophoresis, Quantification of DNA by UV-Visible spectrophotometry, Polymerase Chain Reaction, Real Time PCR and its application in DNA forensics, Capillary Gel Electrophoresis and Genetic analysers, DNA sequencing by Sanger Method, Southern blotting, Northern blotting, Western blotting, Iso-electric focusing, Bioinformatics: DNA/Protein Sequence





## **National Forensic Sciences University**

**Name of the Post: Junior Scientific Officer (Forensic Accounting)**

### **Syllabus**



#### **Unit – 1**

Accounting Principles, Concepts, and Conventions, Conceptual Framework of Financial Statements, Preparation of Final Accounts, Financial Statement Analysis, Traditional and Modern Methods of Analysis, Meaning and Objectives of Audit, Types of Audit, Internal Control, Vouching, Auditors Report, Special Audits and Investigations, Global Financial Reporting Standards, Indian Accounting Standards (Ind-As), FAIS – Standards of Auditing (ICAI), Bank Audit, Types, Concurrent Audit, Forensic Audit – Legal Framework and Laws Regulations (Indian and International Laws of Fraud Investigation), Taxation: Income Tax, Basic Concepts, Corporate Tax Planning, Concepts and Significance, E-Filing of Income-Tax Returns, Goods and Services Tax (GST): Objectives and Main Provisions, GST Filing.

#### **Unit – 2**

Financial Management, Concept & Functions, Time Value of Money, Risk and Return, Capital Structure – Theories, Cost of Capital - Sources and Finance, Budgeting and Budgetary Control – Types and Process, Leverages – Operating, Financial and Combined Leverages, Working Capital Management – Cash, Inventory, Receivables and Payables Management.

#### **Unit-3**

Basics of Forensic Accounting & Fraud Investigation, Fraud Tree, Types of Crimes, Nature & Types of White Collar Crimes, Anomalies Identification, Red Flags/Green Flags, Mule Accounts, Hawala and Money Laundering, Compliance and Reporting in Money Laundering, ASINT & OSINT Tools for Search & Investigation, Risk Management Framework.

#### **Unit-4**

Fraud Investigation – Benford Law, Bankruptcy Analysis, Financial Data Manipulations, Identification of Financial Health, CAAT Tools for Investigation - Bank Statement Analysis, SSS & SSD Test, RSF Test, Spreadsheets Analysis – Lookup Functions, Power Query, Pivot Tables, Data Cleaning, Data Analysis and Visualization, VBA & MACROS etc.


#### **Unit-5**

Dark & Deep Web Investigation for Financial Crimes, Cryptocurrency Tracing & Investigation, Data Gathering and Suspicious Transaction Reporting, Legal Aspect of Forensic Accounting viz. PMLA, SARFASI Act, FEMA, etc., Application of AI & ML in Investigation and Analysis. Report Writing and Presentation Skills, Understanding Digital Forensic Tools in Investigation.

<b>Name of the Post</b>	Junior Scientific Officer (Forensic Psychology)
<b>Pay Level</b>	Level - 07
<b>Pay Scale</b>	44900 - 142400
<b>SYLLABUS</b>	
<b>Unit - 1</b>	Theoretical understanding, Use and Limitations of Forensic Psychological Investigative Methods, namely, Polygraph, Brain Electrical Oscillations Signature Profiling (BEOS), Narcoanalysis, Layered Voice Analysis (LVA), fMRI and Micro-expressions, Suspect Detection system (SDS); Investigation Report writing, Crime Scene Investigation; Interview and Interrogation; Criminal Profiling.
<b>Unit - 2</b>	Key Perspectives in Psychology, Subfields of Psychology, Psychology and Scientific Method, Theories of Personality; Definition of Crime: Legal and Social, Basis of Criminalization, Nature and Scope of Criminology, Theories of Crime- Individualistic Approach & Environmental Approach, Modern Theories of Personality; Definitions and Dimensions of Victimization, Types of Victims in the Criminal Justice System, Theories of Victimization, Domestic Violence, Women Victims of Crime, Child Victimization, Victim Rights in India, Victim Compensation in India.
<b>Unit - 3</b>	Criminal Justice System; Police Organization at District, State & Central Level, Organization of Courts in India, Jurisdiction of Courts in Criminal Cases; Definition of Law, Constitutional Law (Fundamental Rights and Human Right Commission), Criminal Laws (Major Acts), Basic Understanding of IPC, Criminal Procedure Code and Evidence Act, Recent development of Indian Penal System; Competency of Witness, Eye-witness Testimony and Expert Opinion and its Admissibility; Mental Health Act, Disability Act, NDPS Act, Juvenile Justice Act, Sexual Harassment of Women at Work Place Act, Protection of Children from Sexual Offences Act.
<b>Unit - 4</b>	Psychological Assessment and Types; Intelligence Tests (Wechsler Intelligences Scale for Children/MISIC, Binet Kamat Intelligence Test, Bhatia Intelligence Test Battery); Personality Test (Millon Clinical Multiaxial Inventory (MCMI), 16





	Personality Factor Questionnaire(16-PF), Neo Five Factor Inventory (NEO-PI), Minnesota Multiphasic Personality Inventory (MMPI), Rorschach Inkblot Test, TAT).
<b>Unit - 5</b> 	Psychopathology and related disorders; Concept of abnormality; Intellectual Disability; Personality disorder; Schizophrenia and Other Psychotic Disorders; Mood disorders; substance use disorders; Conduct disorder and Violent behaviour in children; Sexually harmful adults.



**Name of the Post:** Junior Scientific Officer (NDPS)  
**Pay level:** Level-7  
**Pay Scale:** 44900-142400  
**Medium:** English

**Syllabus:**

**Unit 1: Introduction to Forensic Science**

Introduction to Forensic Science, History and Development of Forensic Science, Basic Principles of Forensic Science, Overview of Central and State Forensic Science Laboratories, Organizational structure, Police Structure and Roles and Responsibilities of Police, Physical Evidences, Classification of Physical Evidences, their role in criminal investigations and trials. Crime Scene Processing, Securing the crime scene, Documentation, collection, preservation, packaging of evidences, sealing, labeling, and forwarding of evidences, chain of custody, and courtroom testimony, Crime Scene Ethics. Admissibility of forensic evidence in the court of law.

**Unit 2: Fundamental Analytical Chemistry**

Acid-Base Theory: pH, pKa, pKb values, and buffers. Analytical Methods: Classical and instrumental methods including volumetric, titrimetric, and gravimetric techniques. Basic concepts of mole and Molarity Understanding about the principles of extraction and distribution ratio, pH extraction curve, masking agents, salting out, single vs. multiple extractions, solid phase extraction, accelerated solvent extraction, ultrasonic extraction, and heat reflux extraction. Fundamental idea about periodic table and periodicity. Basic idea of main group elements and common reagents used in organic synthesis.

**Statistics:** Mean, mode, median, correlation, regression analysis, null hypothesis, variance, t-test, and chi-square test, probability and principle component analysis.

**Unit 3: Narcotic Drugs and Psychotropic Substances**

Controlled Drugs and Precursors, Classification of controlled substances on the basis of action on the central nervous system.. Morphology and active constituents of Papaver somniferum; Cannabis sativa, and Coca plant Sampling and analytical techniques for qualitative and quantitative analysis. Systematic chemical analysis of Amphetamines, Benzodiazepines, Barbiturates, LSD, Mescaline, Cathinones and Psilocybin Mandatory provisions of NDPS Act 1985. Designer Drugs New psychoactive substances

Clandestine Laboratory Investigation. Collection of evidences from narcotic raids and clandestine laboratories.





#### **Unit 4: Fundamentals of Instrumental Techniques**

Introduction to Chromatography, adsorption, partition, ion –exchange, affinity chromatography, their principles and forensic applications of chromatography. Gas Chromatography , principle, types and instrumentation , high performance liquid chromatography , principle , instrumentation and applications. Hyphenated Techniques GC-MS , LC-MC and HPTLC.


Introduction to basics of Spectroscopy: UV-Visible, IR, Raman and NMR

Hyphenated Techniques- GCMS, LCMS

#### **Unit 5: Quality Management System**

Overview of ISO 9001 & ISO 17025:2017 requirements. Quality Control, Quality Assurance and Total Quality Management. Reference Standards & Certified Reference Material, Traceability, validation of the new methods and verification measurement of uncertainty, maintenance and calibration of instruments. Proficiency testing, Quality Audit, Management Review Meeting, Importance of Accreditation of Forensic Science Laboratories.



Name of Post	Junior Scientific Officer (Multimedia Forensics)
Pay Level	Level - 7
Pay Scale	(44900 - 142400)
Medium	English
 Syllabus	Unit - 1 Fundamentals of Multimedia Technologies: Definition and Types of Multimedia Evidences, Computer and Its Components, Computer Hardware and Software, DVR, NVR, Metadata Analysis, Types of CCTV Cameras, Basics of Operating System, Understanding of Various Filesystems. (10%)
	Unit - 2 Multimedia Forensic Investigations: Digital Crime Scene and Electronic Evidence Management (including hashing, chain of custody, and others), Audio Authentication and Enhancement, Video / Image Authentication and Enhancement, Speaker Profiling, Digital Signal Processing, Digital Image Processing, Crime Scene Photography and Videography (35%)
	Unit - 3 Compliance, Regulations, SoPs and Legal Aspects: ISO 17025:2017 and various accreditation standards of Digital Forensic Laboratories including 79A, Cyber Laws, Important Sections and Subsection of Existing Laws and Newly Introduced Laws, SoPs for Acquiring, Handling and Preserving Digital Evidences, Best Practices in Multimedia Forensics, International Guidelines and Compliances (20%)
	Unit - 4 Emerging Trends in Advanced Multimedia Forensics: Solving Cases related to Advanced Technology like Artificial Intelligence, OSINT and social media investigation, Fake News, Metaverse, Deepfake audio and video analysis, Gait Pattern Analysis, Photogrammetric Analysis, Device Source Identification, Video Analytics and Video Summarization. (25%)
	Unit - 5 Logical Reasoning, Communication and Analytical Skills (10%)

## **Syllabus Junior Scientific Officer (NSTS)**

### **Unit 1: Introduction to Food chemistry :**

Basic chemistry of major food components, carbohydrates, Proteins, Fats & Fatty Acids, their definition, composition, structure, functional properties. Chemistry of Macronutrients and micronutrients (Majority Vitamins and Minerals) Food pigments, food flavours, Enzymes, Water soluble & Fat soluble vitamins, Role of minerals in nutrient. Nutraceuticals,. Food supplements, Dietary supplements , Genetically modified foods

Standards of quality and safety of food and food products laid down in the FSSAI Regulation 2011, including current food safety issues like antibiotic residues in the milk, honey, poultry,. Bureau of Indian Standards relevant to food safety, Principles methodology, technology of food preservation Principles of packaging of food packaging and labeling requirement as per 2011

### **Unit :2 Introduction to Antidope Forensics & Wada banned Substances**



Doping & Sports Forensics; Problem of Doping in Sports; Types of Sports under anti-doping norms; Introduction to Dope Drugs; New medicines and medical technologies; Stimulants, Anabolic Steroids, Energy Boosters, Contraband Drugs, Growth Hormones, Diuretics, Synthetic Oxygen Carriers, Blood Doping, Insulin, Gene Doping; Therapeutic drug use exemptions. Cannabinoids and opioids in doping.

Pharmacodynamics and Pharmacokinetics of Dope drugs; Protecting the health of the athlete and maintaining clean sport; Healthcare providers at major sporting events; National & International Laws governing doping in sports; Anti- Doping Agencies NADA & WADA; Need of Doping Education & Awareness among athletes.

### **Unit 3 : Fundamental Analytical Chemistry**

Acid-Base Theory: pH, pKa, pKb values, and buffers. Analytical Methods: Classical and instrumental methods including volumetric, titrimetric, and gravimetric techniques. Basic concepts of mole and Molarity Understanding about the principles of extraction and distribution ratio, pH extraction curve, masking agents, salting out, single vs. multiple extractions, solid phase extraction, accelerated solvent extraction, ultrasonic extraction, and heat reflux extraction. Fundamental idea about periodic table and



periodicity. Basic idea of main group elements and common reagents used in organic synthesis.

**Statistics:** Mean, mode, median, correlation, regression analysis, null hypothesis, variance, t-test, and chi-square test, probability and principle component analysis.

#### **Unit 4: Fundamentals of Instrumental Techniques**

Introduction to Chromatography, adsorption, partition, ion -exchange, affinity chromatography, their principles and forensic applications of chromatography. Gas Chromatography , principle, types and instrumentation , high performance liquid chromatography , principle , instrumentation and applications. Hyphenated Techniques GC-MS , LC-MC and HPTLC.

Introduction to basics of Spectroscopy: UV-Visible, IR, Raman and NMR  
Hyphenated Techniques- GCMS, LCMS

#### **Unit 5: Quality Management System**

Overview of ISO 9001 & ISO 17025:2017 requirements. Quality Control, Quality Assurance and Total Quality Management. Reference Standards & Certified Reference Material, Traceability, validation of the new methods and verification measurement of uncertainty, maintenance and calibration of instruments. Proficiency testing, Quality Audit, Management Review Meeting, Importance of Accreditation of Forensic Science Laboratories.



<b>Name of Post</b>	Senior Scientific Assistant (Cyber Security)
<b>Pay Level</b>	Level - 6
<b>Pay Scale</b>	(35400 - 112400)
<b>Medium</b>	English
<b>Syllabus</b>	<p>Unit - 1 Fundamentals of IT/ICT: Computer and Its Components, Computer Hardware and Software, Basics of Operating System, Networking Concepts, Fundamentals of Programming, Understanding of Various Filesystems, cyber attacks and types. (10%)</p> <p>Unit - 2 Cyber Security: OS Security, Network Security, Application Security, Database Security, Vulnerability Assessment and Penetration Security, Fundamentals of Malware Analysis, OS Hardening, Log Analysis, Security Information and Event Management (SIEM), Exploits, Threat Intelligence, OSINT, Basics of SOC / NOC, Introduction to CSIRT / CERT, BCP. (30%)</p> <p>Unit - 3 Compliance, Regulations, SoPs and Legal Aspects: ISO 27001 and other accreditation standards of Cyber Security, Security Audits and Compliance, Cyber Laws, Important Sections and Subsection of Existing Laws and New Laws, Incident Response Management, Basics of Computer Forensics; Mobile Forensics; File Systems; Boot Processes; MBR, VBR, GPT, Standard Operating Procedures in Digital Forensics, Basic Understanding of New Laws (Bhartiya Sakshya Sanhita, Bharatiya Nyaya Sanhita, Bharatiya Nagarik Suraksha) (25%)</p> <p>Unit - 4 Emerging Trends in Cyber Security: Role of Artificial Intelligence, Blockchain, IoT and other technologies in implementing Cyber Security. Securing Industrial IoT and Critical Infrastructure, Securing virtual environment like cloud and metaverse. (25%)</p> <p>Unit - 5 Logical Reasoning, Communication and Analytical Skills , General Knowledge, English &amp; English Grammar, Understanding of Office Procedure Manual, Simple Arithmetic, General Intelligence &amp; Reasoning, Understanding of Cyber Crimes.(10%)</p>







<b>Name of Post</b>	Senior Scientific Assistant (Digital Forensics)
<b>Pay Level</b>	Level - 6
<b>Pay Scale</b>	(35400 - 112400)
<b>Medium</b>	English
<b>Syllabus</b>	<p>Unit - 1 Fundamentals of Digital Technology: Computer and Its Components, Computer Hardware and Software, Basics of Operating System, Networking Concepts, Fundamentals of Programming, Understanding of Various Filesystems. (10%)</p> <p>Unit - 2 Digital Forensics and Cyber Crime Investigations: Cyber Crime Scene and Electronic Evidence Management (including hashing, chain of custody, and others), Principle of Digital Forensic Investigations, Branches of Digital Forensics, Windows Forensics, Linux and MAC Forensics, Network Forensics, Memory Forensics, Multimedia Forensics (35%)</p> <p>Unit - 3 Compliance, Regulations, SoPs and Legal Aspects: ISO 17025:2017 and various accreditation standards of Digital Forensic Laboratories including 79A, Cyber Laws, Important Sections and Subsection of Existing Laws and Newly Introduced Laws, SoPs for Acquiring, Handling and Preserving Digital Evidences, Best Practices in Digital Forensics, International Guidelines and Compliances (20%)</p> <p>Unit - 4 Emerging Trends in Advanced Digital Forensics: Solving Cases related to Advance Technology like IoT, Blockchain, Drone, Artificial Intelligence, Deep/Dark web, OSINT and social media investigation, Cryptocurrencies, Cloud, Fake News, Metaverse, Unknown Devices / Operating Systems, Deepfake audio and video analysis. (25%)</p> <p>Unit - 5 Logical Reasoning, Communication and Analytical Skills (10%)</p>

**Syllabus for the Preliminary Test for the recruitment of ~~SSC~~ SSA for Center of Excellence in DNA Forensics, NFSU, Gandhinagar**

**1. Fundamentals of Forensic Biology**

Definition and scope of forensic biology, Historical development and evolution of forensic biology, Different domains of forensic biology, Types of biological evidence, Importance of biological evidence in forensic investigation, Procedure for Collection, Preservation, packing, sealing, and forwarding of biological samples.



**2. Cell Biology and Basic Biochemistry**

Structure and function of cell and cellular organelles, Amino acids: structure and functional group properties. Composition of proteins, Primary, Secondary and Tertiary structure of protein. Definition, biological importance, classification and chemistry of Carbohydrates and Lipids. Structure and functions of nucleic acids (DNA and RNA). Overview of DNA Replication, Transcription, and Translation. Basics of pH and Buffer. Principles and application of centrifugation techniques.

**3. Forensic Serology**

Blood and its composition, Haemoglobin and its variants, Theories and biochemical tests for the identification of blood, Blood Typing/Grouping : 'ABO' system and its significance in forensic investigation, Other blood group antigens: 'Rh sub types', MN, I, P, Kell, Duffy, Kidd, Lewis, Lutheran and Bombay blood group, Forensic examination and biochemical tests for the identification of semen and other body fluids: vomit, faeces, urine, saliva, and vaginal secretions. Technological advancements in Forensic serology

**4. Microscopy**

Introduction to principles, working and application of Compound Microscope, Stereo Microscope, Comparison Microscope, Phase Contrast Microscope, Fluorescence Microscope and Electron Microscope.

**5. Biostatistics**

Definition and scope of biostatistics, Importance of statistical methods in biological and health sciences. Descriptive Statistics: Measures of central tendency (mean, median, mode). Measures of dispersion (range, variance, standard deviation). Frequency distributions and graphical representation of data. Probability and Probability Distributions: Basic concepts of probability. Probability distributions (binomial, Poisson, normal). Probability rules and Bayes' theorem. Inferential Statistics: Hypothesis testing, Confidence intervals, Type I and Type II errors. Parametric and Nonparametric Tests: t-tests (one-sample, two-sample), Analysis of variance (ANOVA), Chi-square tests. Nonparametric tests (Wilcoxon rank-sum, Kruskal-Wallis). Factorial Component Analysis and Principle Component Analysis.

**6. Molecular Biology Techniques**

Techniques of DNA extraction, Agarose Gel Electrophoresis, Polyacrylamide Gel Electrophoresis, Quantification of DNA by UV-Visible spectrophotometry, Polymerase Chain Reaction, Real Time PCR and its application in DNA forensics, Capillary Gel Electrophoresis and Genetic analysers, DNA sequencing by Sanger Method, Southern blotting, Northern blotting, Western blotting, Iso-electric focusing, Bioinformatics: DNA/Protein Sequence



alignment by BLAST and its variants, DNA/Protein Sequence Databases, BOLD database.

**7. Forensic DNA analysis**

Sources of DNA at Crime scenes, Procedure for collection and preservation of biological sample for DNA analysis, History of DNA fingerprinting and DNA polymorphism, Genes and DNA markers in forensic DNA analysis, Various commercial kits for STR profiling, STR profile analysis and its interpretation, Statistical analysis of DNA profiles; Random Match Probability and Likelihood Ratio, Low Copy number (LCN) DNA typing and its SoP, Y-STR and X-STR markers analysis, Mitochondrial DNA analysis and its forensic importance, Various national/international guidelines for forensic DNA analysis and Interpretations. Report writing and Expert Testimony.

**8. Recent Developments and Future Directions in DNA profiling**

Next Generation Sequencing Technologies: Sequencing-By-Synthesis, Real-Time Sequencing, Single Nucleotide Polymorphism (SNP) and its applications in forensic investigation, Prediction of ancestry, physical characteristics, biogeography using NGS and other techniques, Genetic genealogy in forensic investigation, Classical, RNA based and DNA methylation-based approaches.

**9. Population Genetics**

Basic Concepts in Population Genetics, Hardy-Weinberg Principle and Linkage disequilibrium, Causes of evolution- admixture, selection, mutation, drift, Genetic Diversity and variations, Haplotype analysis, Various tools for phylogenetic analysis. Factors driving evolution and fundamental principles of population genetics.

**10. Wildlife Forensics**

Threats to the natural resources and wild species inhabiting globally; Overview of IUCN Red Data Book; CITES; Wildlife (Protection) Act, 1972 of India and other related acts; Different Methods of Poaching; Conventional methods of species identification; Morphological identification and examination of wildlife parts and products; Application of DNA technologies used in Wildlife Forensics and Conservation Genetics.



**11. Quality Control and Quality Assurance in Forensic Laboratory**

Introduction to Quality Management, Total Quality Management (TQM) principles and their application in forensic laboratories, Accreditation in Forensic Science Laboratories: ISO standards and their role in accreditation, Traceability and Validation: Methods for the validation of new analytical procedures, Equipment Maintenance and Calibration, Proficiency Testing Programs, Internal Audit and External Audit, Overview of Laboratory Information Management System (LIMS), Biohazard Waste Management and Contamination control

**12. Acts And Legal Frameworks Related to Forensic Analysis**

The Bharatiya Nyaya (Second) Sanhita, Bharatiya Nagarik Suraksha Sanhita and the Bharatiya Sakshya Act, The Criminal Procedure (Identification) Act.

<b>Name of the Post</b>	Senior Scientific Assistant (Forensic Psychology)
<b>Pay Level</b>	Level - 06
<b>Pay Scale</b>	35400 - 112400
<b>SYLLABUS</b>	
<b>Unit - 1</b>	Use and Limitations of Forensic Psychological Investigative Methods, namely, Polygraph, Brain Electrical Oscillations Signature Profiling (BEOS), Narcoanalysis, Layered Voice Analysis (LVA), fMRI and Micro-expressions, Suspect Detection system (SDS); Report writing.
<b>Unit - 2</b>	Definition of Crime, Nature and Scope of Criminology; Theories of Crime; Definitions of Victimization; Types of Victims in the Criminal Justice System; Theories of Victimization; Domestic Violence; Women Victims of Crime; Child Victimization; Victim Rights in India.
<b>Unit - 3</b>	Definition of Law, Fundamental Rights and Human Right Commission, Criminal Laws, Basic Understanding of IPC, Criminal Procedure Code and Evidence Act; Eye-witness Testimony and Expert Opinion and its Admissibility; Mental Health Act, Disability Act, NDPS Act, Juvenile Justice Act, Sexual Harassment of Women at Work Place Act, Protection of Children from Sexual Offences Act; Recent development of Indian Penal System.
<b>Unit - 4</b>	Key Perspectives in Psychology. Subfields of Psychology. Psychology and Scientific Method, Theories of Personality; Psychological Assessment and Types; Types of Intelligence Tests; Types of Personality Test.
<b>Unit - 5</b>	Psychopathology and related disorders; Concept of abnormality; Intellectual Disability; Personality disorder; Schizophrenia and Other Psychotic Disorders; Mood disorders; substance use disorders; Conduct disorder and Violent behaviour in children; Sexually harmful adults.





**Name of the Post:** Senior Scientific Assistant (NDPS)  
**Pay level:** Level-6  
**Pay Scale:** 35400-112400  
**Medium:** English

**Syllabus:**

**Unit 1: Introduction to Forensic Science**

Introduction to Forensic Science, History and Development of Forensic Science, Basic Principles of Forensic Science, Overview of Central and State Forensic Science Laboratories, Organizational structure, Police Structure and Roles and Responsibilities of Police, Physical Evidences, Classification of Physical Evidences, their role in criminal investigations and trials. Crime Scene Processing, Securing the crime scene, Documentation, collection, preservation, packaging of evidences, sealing, labeling, and forwarding of evidences, chain of custody, and courtroom testimony, Crime Scene Ethics. Admissibility of forensic evidence in the court of law.

**Unit 2: Fundamental Analytical Chemistry**

Acid-Base Theory: pH, pKa, pKb values, and buffers. Analytical Methods: Classical and instrumental methods including volumetric, titrimetric, and gravimetric techniques. Understanding about the principles of extraction and distribution ratio, pH extraction curve, masking agents, salting out, single vs. multiple extractions, solid phase extraction, accelerated solvent extraction, ultrasonic extraction, and heat reflux extraction. Fundamental idea about periodic table and periodicity. Basic idea of main group elements and common reagents used in organic synthesis.

**Statistics:** Mean, mode, median, correlation, regression analysis, null hypothesis, variance, t-test, and chi-square test.

**Unit 3: Narcotic Drugs and Psychotropic Substances**

Controlled Drugs and Precursors, Classification of controlled substances on the basis of action on the central nervous system.. Morphology and active constituents of Papaver somniferum, Cannabis sativa, and Coca plant Sampling, and analytical techniques for qualitative and quantitative analysis. Systematic chemical analysis of Amphetamines, Benzodiazepines, Barbiturates, LSD, Mescaline, Cathinones and Psilocybin Mandatory provisions of NDPS Act 1985. Designer Drugs New psychoactive substances

Clandestine Laboratory Investigation. Collection of evidences from narcotic raids and clandestine laboratories.



#### **Unit 4: Fundamentals of Instrumental Techniques**

Introduction to Chromatography, adsorption, partition, ion –exchange, affinity chromatography, their principles and forensic applications of chromatography. Gas Chromatography , principle, types and instrumentation , high performance liquid chromatography , principle , instrumentation and applications. Hyphenated Techniques GC-MS , LC-MC and HPTLC.

Introduction to basics of Spectroscopy: UV-Visible, IR, Raman

Hyphenated Techniques- GCMS, LCMS



#### **Unit 5: Quality Management System**

Overview of ISO 9001 & ISO 17025:2017 requirements. Quality Control, Quality Assurance and Total Quality Management. Reference Standards & Certified Reference Material, Traceability, validation of the new methods and verification measurement of uncertainty, maintenance and calibration of instruments. Proficiency testing, Quality Audit, Management Review Meeting, Importance of Accreditation of Forensic Science Laboratories.



<b>Name of Post</b>	Senior Scientific Assistant <b>(Multimedia Forensics)</b>
<b>Pay Level</b>	Level - 6
<b>Pay Scale</b>	(35400 - 112400)
<b>Medium</b>	English
<b>Syllabus</b>	Unit - 1 Fundamentals of Multimedia Technologies: Definition and Types of Multimedia Evidences, Computer and Its Components, Computer Hardware and Software, DVR, NVR, Metadata Analysis, Types of CCTV Cameras, Basics of Operating System, Understanding of Various Filesystems. (10%)
	Unit - 2 Multimedia Forensic Investigations: Digital Crime Scene and Electronic Evidence Management (including hashing, chain of custody, and others), Audio Authentication and Enhancement, Video / Image Authentication and Enhancement, Speaker Profiling, Digital Signal Processing, Digital Image Processing, Crime Scene Photography and Videography (35%)
	Unit - 3 Compliance, Regulations, SoPs and Legal Aspects: ISO 17025:2017 and various accreditation standards of Digital Forensic Laboratories including 79A, Cyber Laws, Important Sections and Subsection of Existing Laws and Newly Introduced Laws, SoPs for Acquiring, Handling and Preserving Digital Evidences, Best Practices in Multimedia Forensics, International Guidelines and Compliances (20%)
	Unit - 4 Emerging Trends in Advanced Multimedia Forensics: Solving Cases related to Advanced Technology like Artificial Intelligence, OSINT and social media investigation, Fake News, Metaverse, Deepfake audio and video analysis, Gait Pattern Analysis, Photogrammetric Analysis, Device Source Identification, Video Analytics and Video Summarization. (25%)
	Unit - 5 Logical Reasoning, Communication and Analytical Skills (10%)





## **Syllabus Senior Scientific Assistant (NSTS)**

### **Unit 1: Introduction to Food chemistry :**

Basic chemistry of major food components, carbohydrates, Proteins, Fats, their definition, composition, structure, functional properties. Chemistry of Macronutrients and micronutrients (Majority Vitamins and Minerals) Food pigments, food flavours, Enzymes, Water soluble & Fat soluble vitamins, Role of minerals in nutrient. Nutraceuticals,. Food supplements, Dietary supplements , Genetically modified foods

Standards of quality and safety of food and food products laid down in the FSSAI Regulation 2011, including current food safety issues like antibiotic residues in the milk, honey, poultry,. Bureau of Indian Standards relevant to food safety, Principles methodology, technology of food preservation Principles of packaging of food packaging and labeling requirement as per 2011

### **Unit:2 Introduction to Antidope Forensics & Wada banned Substances**

Doping & Sports Forensics; Problem of Doping in Sports; Types of Sports under anti-doping norms; Introduction to Dope Drugs; New medicines and medical technologies; Stimulants, Anabolic Steroids, Energy Boosters, Contraband Drugs, Growth Hormones, Diuretics, Synthetic Oxygen Carriers, Blood Doping, Insulin, Gene Doping; Therapeutic drug use exemptions. Cannabinoids and opioids in doping.

Pharmacodynamics and Pharmacokinetics of Dope drugs; Protecting the health of the athlete and maintaining clean sport; Healthcare providers at major sporting events; National & International Laws governing doping in sports; Anti- Doping Agencies NADA & WADA; Need of Doping Education & Awareness among athletes.

### **Unit 3 : Fundamental Analytical Chemistry**

Acid-Base Theory: pH, pKa, pKb values, and buffers. Analytical Methods: Classical and instrumental methods including volumetric, titrimetric, and gravimetric techniques. Basic concepts of mole and Molarity Understanding about the principles of extraction and distribution ratio, pH extraction curve, masking agents, salting out, single vs. multiple extractions, solid phase extraction, accelerated solvent extraction, ultrasonic extraction, and heat reflux extraction. Fundamental idea about periodic table and





periodicity. Basic idea of main group elements and common reagents used in organic synthesis.

**Statistics:** Mean, mode, median, correlation, regression analysis, null hypothesis, variance, t-test, and chi-square test, probability and principle component analysis.

#### **Unit 4: Fundamentals of Instrumental Techniques**

Introduction to Chromatography, adsorption, partition, ion -exchange, affinity chromatography, their principles and forensic applications of chromatography. Gas Chromatography , principle, types and instrumentation , high performance liquid chromatography , principle , instrumentation and applications. Hyphenated Techniques GC-MS , LC-MC and HPTLC.

Introduction to basics of Spectroscopy: UV-Visible, IR, Raman Hyphenated Techniques- GCMS, LCMS

#### **Unit 5: Quality Management System**

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