



Shri Vaishnav Vidyapeeth Vishwavidyalaya, Indore
Shri Vaishnav Institute of Forensic Science

Choice Based Credit System (CBCS)

B. Sc. with Major Forensics Science - Batch (2023-27)

SEMESTER- III

BFS301 FORENSIC CHEMISTRY AND EXPLOSIVE

COURSE CODE	CATEGORY	COURSE NAME	TEACHING & EVALUATION SCHEME									
			THEORY			PRACTICAL			L	T	P	CREDITS
			END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*					
BFS301	Major	Forensic Chemistry and Explosive	60	20	20	60	40	4	0	4	6	

Legends: L - Lecture; T - Tutorial/Teacher Guided Student Activity; P – Practical; C - Credit;

***Teacher Assessment shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.**

Course Objectives: : After studying this paper the students will know –

1. The methods of analyzing contaminants in petroleum products.
2. The classification and analysis of Forensic Chemistry.
3. The method of searching, collecting, preserving and analyzing arson evidence.
4. The classification of explosives, including the synthesis and characterization of representative analogs.

Course Outcomes: After studying this paper

1. The student will be able to understand the concept of forensic chemistry
2. They will be able to know the chemistry of different petroleum products and explosive Substances.
3. They will be able to examine the alcoholic and non-alcoholic beverages.

Unit 1: Petroleum and Petroleum Products

Distillation and fractionation of petroleum. Commercial uses of different petroleum fractions. Analysis of petroleum products. Analysis of traces of petroleum products in forensic exhibits. Comparison of petroleum products. Adulteration of petroleum products.

Unit 2: Analysis of beverages:

Analysis of Beverages: Alcoholic and non-alcoholic beverages and their composition, Analysis of alcoholic beverages as per BIS and PFA Act. Distinction between licit and illicit liquors.

Unit 3: Cases Involving Arson

Chemistry of fire. Conditions for fire. Fire scene patterns. Location of point of ignition. Recognition of type of fire. Searching the fire scene. Collection and preservation of arson evidence. Analysis of fire debris. Analysis of ignitable liquid residue. Post-flashover burning. Scientific investigation and evaluation of clue materials. Information from smoke staining.

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Unit 4: Explosives I

Classification of explosives: Low explosives and high explosives. Homemade explosives. Military explosives. Blasting agents. Synthesis and characteristics of TNT. Explosion process. Blast waves.

Unit 5: Explosive II

Bomb scene management. Searching the scene of explosion. Mechanism of explosion. Post blast residue collection and analysis. Case Studies of explosion cases. **Blast injuries:** Detection of hidden explosives.

Practicals :

1. To carry out analysis of gasoline.
2. To carry out analysis of diesel.
3. To carry out analysis of kerosene oil.
4. To analyze arson accelerators.
5. To prepare a case report on a case involving arson.
6. To carry out analysis of explosive substances.
7. To separate explosive substances using thin layer chromatography.
8. To prepare a case report on bomb scene management.

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Suggested Readings

1. J.D. DeHaan, *Kirk's Fire Investigation*, 3rd Edition, Prentice Hall, New Jersey (1991).
2. 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).
3. R. Saferstein, *Criminalistics*, 8th Edition, Prentice Hall, New Jersey (2004).
4. W.J. Tilstone, M.L. Hastrup and C. Hald, Fisher's, *Techniques of Crime Scene Investigation*, CRC Press, Boca Raton (2013).
5. S. Ballou, M. Houck, J.A. Siegel, C.A. Crouse, J.J. Lentini and S. Palenik in *Forensic Science*, D.H. Ubelaker (Ed.), Wiley-Blackwell, Chichester (2013).

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SEMESTER- III

BFS302 CHEMISTRY

COURSE CODE	CATEGORY	COURSE NAME	TEACHING & EVALUATION SCHEME									
			THEORY			PRACTICAL			L	T	P	CREDITS
			END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*					
BFS302	Minor	Chemistry	60	20	20	60	40	4	0	4	6	

Legends: L - Lecture; T - Tutorial/Teacher Guided Student Activity; P – Practical; C - Credit;

***Teacher Assessment shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.**

Course Objectives: After studying this paper the students will know –

1. The importance of basic chemistry for studying forensic science.
2. The analysis and effects of chemical changes.
3. The chemistry of everyday life.

Course Outcomes: After studying this paper the student will be able to-

1. The students will be able to get knowledge about Modern Periodic Table and Periodic properties.
2. The students will be acquainted with theory of acid and bases, Lowry –Bronsted theory of acid and bases.
3. The students will be able to understand chemistry of alcohols, phenols and ethers.
4. The students will be able to understand Chemistry in Everyday like Chemicals in medicines and food.

Unit 1

I. Introduction to Periodic Table

Study of Modern Periodic Table, Periodic properties –Atomic radius, ionization potential, electron affinity, electro negativity, metallic characters, Non-metallic characters and magnetic properties, Comparative study of S and P block elements.

II. Acids, Bases and Solvents

Definition of acids and bases, Arrhenius theory of acid and bases, Lowry –Bronsted theory of acid and bases, Lewis concept of acid and bases, Properties of solvents - M.P-B.P range, dipole moment, dielectric constant, Lewis acid-base character and types of solvent.

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UNIT 2: Organic Compounds I

Alcohols: Nomenclature, methods of preparation, physical and chemical properties, identification of primary, secondary and tertiary alcohols, mechanism of dehydration, uses with special reference to methanol and ethanol.

Phenols: Nomenclature, methods of preparation, physical and chemical properties, acidic nature of phenol, electrophilic substitution reactions, uses of phenols.

Ethers: Nomenclature, methods of preparation, physical and chemical properties, uses.

UNIT 3: Organic Compounds II

Haloalkanes: Nomenclature, nature of C-X bond, physical and chemical properties, mechanism of substitution reactions, optical rotation.

Haloarenes: Nature of C-X bond, substitution reactions (Directive influence of halogen in mono substituted compounds only. Uses and environmental effects of - dichloromethane, trichloromethane, tetrachloromethane, iodoform freons, DDT.

UNIT 4: Chemistry in Everyday life

Chemicals in medicines- analgesics, tranquilizers antiseptics, disinfectants, antimicrobials, antifertility drugs, antibiotics, antacids, antihistamines.

Chemicals in food- preservations, artificial sweetening agents, elementary idea of antioxidants.

Cleansing agents- soaps and detergents, cleansing action.

UNIT 5: Polymers

Polymers- Introduction, types & Classification of polymerization, methods of polymerization (addition and condensation), copolymerization, Reaction mechanism, some important polymers: natural and synthetic like polythene, PVC, nylon polyesters, bakelite, natural & synthetic rubber, Vulcanization of rubber Biodegradable and non-biodegradable polymers.

Dyes, Fabrics, Explosives, Glass: Classification, Methods of preparation, properties and uses

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SEMESTER- III

Practical

1. To determine relative viscosity of given organic liquids by viscometer (Four liquids)
2. To determine the molecular weight of a high polymer by using solutions of different concentrations
3. To determine Pk value of given weak acid by pH-metric titration with strong base
Analysis of acid and basic radicals
4. pH metric measurement
 - (a) To prepare buffers and standardization of pH meter
 - (b) Determine the molarity of Hcl pH-metrically provided M/10 NaOH
5. Determination of functional groups
6. Analysis of acid and basic radicals
7. Detection of elements

Suggested Readings

1. Advanced Inorganic Chemistry, Volume-I, Nineteenth Edition, Satya Prakash, G. D. Tuli, S. K. Basu, R. D. Madan, S. Chand Publication, ISBN- 81-219-0263-0.
2. Concept and model
3. Concise Inorganic Chemistry, Fifth Edition, of Inorganic Chemistry, Third Edition, Douglas Mc. Doniels, Wiley India. J. D. Lee, Wiley India
4. General Chemistry, Sixth Edition, Raymond Chang, McGraw Hill
5. Morrison, R. N. & Boyd, R. N. Organic Chemistry, Dorling Kindersley (India) Pvt. Ltd. (Pearson Education).
6. Finar, I. L. Organic Chemistry (Volume 1), Dorling Kindersley (India) Pvt. Ltd. (Pearson Education).

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FINGERPRINT EXAMINATION AND BIOMETRY

COURSE CODE	CATEGORY	COURSE NAME	TEACHING & EVALUATION SCHEME									
			THEORY			PRACTICAL			L	T	P	CREDITS
			END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*					
VOFS101	VC	Fingerprint Examination and Biometry	0	0	0	60	40	0	2	4	4	

Legends: L - Lecture; T - Tutorial/Teacher Guided Student Activity; P – Practical; C - Credit;

***Teacher Assessment shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.**

Course Objectives: After studying this paper the students will know –

1. The historical development of fingerprint
2. The basic patterns and types of fingerprints
3. The different developing methods of fingerprint.
4. The impart knowledge of Basic Biometric System.
5. Concepts of Verification and Identification..
6. The classification of biometric processes.

Course Outcomes:

1. They student will be able acquainted with fingerprints and trace their origin.
2. They will be able to understand the pattern of fingerprints and their inner and outer terminus.
3. They will be able to develop the latent fingerprints using various techniques.
4. Student will be able to understand working of biometry
5. Student will know advances in Biometric system
6. Student will understand different Biometric systems

Unit 1: Basics of Fingerprinting

Introduction and history, with special reference to India. Biological basis of fingerprints. Formation of ridges. Fundamental principles of fingerprinting.

Unit 2: Fingerprint characteristics/minutiae.

Types of fingerprints, Fingerprint patterns, characteristics/minutiae of Fingerprint, Plain and rolled fingerprints. Classification and cataloguing of fingerprint record. Automated fingerprint Identification System. Significance of poroscopy and edgeoscopy.

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Unit 3: Development of Fingerprints

Latent prints. Constituents of sweat residue. Latent fingerprints' detection by physical and chemical techniques. Mechanism of detection of fingerprints by different developing reagents.

Unit 4: Fundamental aspects of Biometrics

Definition, characteristics and operation of biometric system, Classification of biometric systems – physiological and behavioral, Strength and weakness of physiological and behavioral biometrics, Multimodal Biometrics.

Unit 5: Biometric Process

Key biometric processes – enrollment, identification and verification, sensor module, feature extraction module, database module, matching module, Positive and negative identification, Performance measures used in biometric systems – FAR, FRR, GAR, FTA, FTE and ATV, Biometric versus traditional technologies.

Practicals:

1. To record plain and rolled fingerprints.
2. To carry out ten digit classification of fingerprints.
3. To identify different fingerprint patterns.
4. To identify core and delta.
5. To carry out ridge tracing and ridge counting.

Suggested Reading-:

1. J.E. Cowger, Friction Ridge Skin, CRC Press, Boca Raton (1983).
2. D.A. Ashbaugh, Quantitative-Qualitative Friction Ridge Analysis, CRC Press, Boca Raton (2000).
3. C. Champod, C. Lennard, P. Margot and M. Stoilovic, Fingerprints and other Ridge Skin Impressions, CRC Press, Boca Raton (2004).
4. Lee and Gaenslen's, Advances in Fingerprint Technology, 3rd Edition, R.S. Ramotowski (Ed.), CRC Press, Boca Raton (2013).
5. S. Nanavati, M. Thieme and R. Nanavati, *Biometrics*, Wiley India Pvt. Ltd. (2002).
6. P. Reid, *Biometrics for Network Security*, New Delhi (2004).
7. J.R. Vacca, *Biometric Technologies and Verification Systems*, Butterworth-Heinemann, Oxford (2007).
8. Anil K. Jain, *Handbook of Biometrics*

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