પરિપત્ર:

ભક્તકવિ નરસિંહ મહેતા યુનિવર્સિટીની સાયન્સ વિદ્યાશાખાનાં અભ્યાસક્રમ ચલાવતી તમામ સંલગ્ન કોલેજોનાં આચાર્યશ્રીઓને સવિનય જણાવવાનું કે સાયન્સ વિદ્યાશાખા હેઠળનો NEP-૨૦૨૦ અંતર્ગત ફોરેન્સિક સાયન્સ વિષય સેમેસ્ટર-૬નો અભ્યાસક્રમ આ સાથે સામેલ છે.

માનનીય કુલપતિશ્રીની મંજુરી અનુસાર સદર અભ્યાસક્રમ શૈક્ષણિક વર્ષ જુન,૨૦૨૫ થી અમલવારી કરવાની રહે છે. સાયન્સ વિદ્યાશાખાનાં અભ્યાસક્રમ ચલાવતી તમામ સંલગ્ન કોલેજો ધ્વારા તેની અમલવારી કરવા જણાવવામાં આવે છે.

Bhakta Kavi Narsinh Mehta University Junagadh.

ખાસ ફરજ પરના અધિકારી
(એકેડેમિક)

ક્રમાંક/બીકેએનએમયુ/ એકેડેમિક/૭૪૩/૨૦૨૫
ભક્તકવિ નરસિંહ મહેતા યુનિવર્સિટી,
સરકારી પોલીટેકનિક કેમ્પસ,
ભક્તકવિ નરસિંહ મહેતા યુનિવર્સિટી રોડ,
ખડીયા, જૂનાગઢ-૩૬૨૨૬૩
તા.૦૩/૧૧/૨૦૨૫

પ્રતિ,

- ભક્તકવિ નરસિંહ મહેતા યુનિવર્સિટી સંલગ્ન સાયન્સ વિદ્યાશાખાનાં અભ્યાસક્રમો ચલાવતી તમામ કોલેજોના આચાર્યશ્રીઓ તરફ....

નકલ સાદર રવાના:-

- માન.કુલપતિશ્રી/ કુલસચિવશ્રીનાં અંગત સચિવશ્રી.
- પરીક્ષા નિયામકશ્રી, ભક્તકવિ નરસિંહ મહેતા યુનિવર્સિટી, જુનાગઢ

નકલ રવાના જાણ તથા યોગ્ય કાર્યવાહી અર્થે:

- સીસ્ટમ મેનેજરશ્રી, આઇ.ટી.સેલ વિભાગ (વેબસાઇટ ઉપર પ્રસિદ્ધ થવા અર્થે.)

BHAKTA KAVI NARSINH MEHTA UNIVERSITY

JUNAGADH

BOARD OF STUDIES

FACULTY OF SCIENCE

SYLLABUS FOR FORENSIC SCIENCE (HONOURS)

PROGRAMME (SEMESTER- VI)

EFFECTIVE FROM JUNE, 2025

BHAKTA KAVI NARSINH MEHTA UNIVERSITY
Syllabus of B.Sc. (Honors) as per NEP-2020
Faculty of Science
Effective from June 2025
Subject: Forensic Science
SEMESTER-VI

SUMMARY OF THE SYLLABUS

Sem. No.	Sr. No.	Category of Course	Course Title	Course Level	Credit	Teaching Hrs.	SEE Marks	CCE Marks	Total Marks	Exam Duration
Sem-6	1	Major-14	Fingerprint & Questioned Documents	5.5	04	60	50	50	100	02:00 Hours
	2	Major-15	Forensic Ballistic & Explosive	5.5	04	60	50	50	100	02:00 Hours
	3	Major-16	Practical Approach concert to Crime scene, Cyber, F.P & Q.D.	5.5	04	120	50	50	100	05:00 Hours
	4	Minor-6	Minor Chemistry-303	5.5	04	2T+4P	50	50	100	02:00 Hours
				Total	**12**					

Course Level	5.5		**Internal Marks**	50
Program	**B.Sc. (Honors)**		**External Marks**	50
Semester	VI		**Practical Internal**	-
Category of Course	Major14: Fingerprint & Questioned Documents		**Practical External**	-
Course Credit	04		**Prac. External Exam Duration**	-
Teaching Hours	60		**Total**	100
Course Code			**Exam Duration**	02:00 Hours
Course Title	Fingerprint & Questioned Documents			

Course Objectives:

- To know the history of fingerprint science
- To explore the development of fingerprint science.
- To introduce the concept and significance of fingerprint in Identification of crime &criminal
- To gain knowledge about fingerprint pattern, types & classification of fingerprint.

Course Learning Outcomes: After completion of the course student can

- Understand the history and development of fingerprint science and its classification systems.
- Identify types of fingerprints and apply physical and chemical methods for their development and lifting**.**
- Take and analyze finger and palm prints from both living and deceased persons.
- Understand the nature and examination of questioned documents and handwriting identification.
- Detect forgeries, alterations, and disguised writings in documents**.**
- Apply forensic techniques for criminal identification and evidence analysis**.**

Course Contents:

Sem.	Unit No.	Syllabi	Teaching Hours
6	**1**	**History and Development of Fingerprints:** **I.1 History and development:** History of Fingerprint Science, main function of FPB, Development of Fingerprint Science, Composition of sweat and secretion of sweat, Pattern types& Ridge characteristics, Ridge tracing, Ridge counting **I.2 Classification of fingerprint:** Various systems for FP classification, Henry classification system, numerical value, symbol, primary classification, secondary classification, sub	**15**

		secondary, classification and final classification, NCIC classification, AFIS classification.	
	2	**Unit-2Types of fingerprint and developmental methods:** II.1 Development, Identification &Presentation of FP II.2 Known prints & Rolled impressions, Direct or Inked prints. II.3 Development of Latent Prints & Lifting techniques II.4 Physical & chemical Methods: Powder techniques & Various chemical techniques, Processing of Post Developed prints. II.5 Taking of finger and palm prints from living and dead person, postmortem fingerprint II.6 Types of fingerprint like Chance prints, latent and visible Prints, plastic prints.	**15**
	3	**Unit 3 Questioned Document:** III.1 Nature and Classification of Document: Nature and problems of documents examination, classification of documents, procurements of standard admitted/ specimen writing, handling and marking of document. III.2 Examination of Questioned documents: Preliminary examination of document, basis of handwriting identification, individuality of hand writing, variation in genuine handwriting, natural variation, Principles of hand writing & signature identification, process of Comparison. III.3 Types of Document and Writing features: Various types of documents- genuine and forge documents and holographic documents, general characteristic of handwriting, individual characteristics of handwriting, basic tools needed for forensic document examination and their use.	**15**
	4	**Unit-4 Examination of Documents:** **IV.1 Disguised writing and Anonymous letters:** Identification of writer, examination of signature, writing instrument and their influence on handwriting. **IV.2 Changes in documents and examination:** Examination of alteration, erasures, overwriting, addition, and obliteration.	**15**

Course Level	5.5		**Internal Marks**	50
Program	**B.Sc. (Honors)**		**External Marks**	50
Semester	VI		**Practical Internal**	-
Category of Course	Major15: Forensic Ballistic & Explosive		**Practical External**	-
Course Credit	4		**Prac. External Exam Duration**	-
Teaching Hours	60		**Total**	100
Course Code			**Exam Duration**	02:00 Hours
Course Title	Forensic Ballistic & Explosive			

Course Objectives:

- To provide students with a comprehensive understanding of the history, development, and classification of firearms and ammunition.
- To familiarize students with the structure, components, and operational features of different types of firearms including rifled and smooth-bore weapons.
- To develop knowledge of ballistic principles, including internal ballistics, ammunition composition, and factors influencing firearm performance.
- To train students in scientific methods of identification and examination of firearms, ammunition, and fired evidence using modern techniques and comparison systems.
- To introduce automated ballistics identification systems and their role in criminal investigations.
- To provide a clear understanding of GSR (Gunshot Residue) and explosives, including collection, analysis, interpretation, and crime scene reconstruction.

Course Learning Outcomes: After completion of the course student can

- Explain the history, development and basic concepts of firearms and ballistics (internal, external, and terminal).
- Describe firearm components, rifling and choke systems, and their operational features.
- Identify and classify ammunition types, primers, propellants and bullets, and understand internal ballistics factors.
- Apply forensic identification techniques for firearms and ammunition — recognize firing-pin, breech-face, extractor/ejector and striation marks, and estimate range of fire.
- Use and understand automated ballistics systems (e.g., IBIS/BDAS) and microscopy for comparison.
- Analyze gunshot residue (GSR) and explosive residues, including collection, laboratory tests, scene management and interpretation for reconstruction.

Course Contents:

Sem.	Unit No.	Syllabi	Teaching Hours
6	1	**Unit–I History and Development of Firearms:** **I.1 History of firearms:** History and background of firearms, Ballistics & its forensic aspects, **I.2 Conventional Concepts of firearms:** their classification and characteristics, various components of small arms, smooth bore and rifled firearms. **I.3 Operational features of firearms:** Barrel, body, Firing pin, Breech face, trigger, cork, and firing mechanism, measurement of strength of barrel & trigger pull. **I.4 Rifled Firearms:** Caliber, Rifling, purpose of rifling, types of rifling and methods to produce rifling to produce rifling, **I.5 Smooth bore firearms**: Bore, Choking & types of choking, Methods of choking purpose of choking, method of choking, purpose of choking.	**15**
	2	**Unit–II Ballistics of firearm– 1:** **II.1 Ammunition:** Types of ammunition, classification and construction features of different types of cartridge, types of primers and priming composition, propellants and their composition, various types of bullets and compositional aspects. **II.2 Core concepts of Internal Ballistics:** Definition, ignition of propellants, shape and size of propellants, manner of burning **II.3 various factors affecting the internal ballistics:** lock time, ignition time, barrel time, erosion, corrosion and gas cutting, equation of motion of projectile, Density of loading, Pressure, Heat problems, Vibration & jump, Measurement of strength of firearm, projectile velocity determination, theory of recoil, methods for measurement of recoil.	**15**
	3	**Unit–III Identification of Firearms:** **III.1 Principles:** Principles and practice of identification of firearms, ammunition and their components, different types of marks produced during firing process on cartridge-firing pin marks, breech face marks, chamber marks, extractor and ejector marks, direction of lands and grooves, striation marks on lands and grooves, identification of various parts of firearms, class and individual characteristics, determination of range of fire- burning,	**15**

		scorching, blackening, tattooing and metal fouling, shot dispersion and GSR distribution, time of firing, different methods employed and their limitations, stereo and comparison microscopy, automatic bullet and cartridge comparison system. **III. 2 Automated Techniques used in Ballistics:** Basic Introduction to Integrated Ballistic Identification System (IBIS) and Ballistic Data Acquisition System (BDAS).	
	4	**Unit– IV GSR & Explosive:** **IV.1 Analysis of GSR:** Mechanism of formation of GSR sources and collection, spot test, chemical test, identification of shooter and instrumental methods of GSR analysis, management and reconstruction of crime scene **IV.2 Explosives: -** Definition, classification, nature, composition, chemistry and characteristics of explosives, pyro techniques, IEDs. Specific approach to scene of explosion. Systematic examination of explosive and explosion residue in the laboratory using chemical and instrumental techniques in the laboratory and interpretation of results, explosive act.	**15**

Course Level	5.5		**Internal Marks**	-
Program	**B.Sc. (Honors)**		**External Marks**	-
Semester	VI		**Practical Internal**	50
Category of Course	Major-16: Practical Approach concert to Crime scene, Cyber, F.P & Q.D.		**Practical External**	50
Course Credit	4		**Prac. External Exam Duration**	05:00 Hours
Teaching Hours	60		**Total**	100
Course Code			**Exam Duration**	-
Course Title	Practical Approach concert to Crime scene, Cyber, F.P & Q.D.			

1	**Fingerprint:** (Fingerprint is the corner stone of forensic science because they provide a scientifically reliable method of person identification that supports criminal investigation. Fingerprint play crucial role in forensic science due to their permanence uniqueness, and ease of collection)	To identify ridge characteristics, ridge tracing and ridge counting. Perform Henry ten-digit classification for given fingerprint slip. Compare fingerprint To develop latent fingerprints with powder, fuming and chemical methods.
2	**Question document:** Question document analysis is a vital branch of forensic science that deals with the examination of documents that are in dispute or suspected to be forged or altered. In essence, question document analysis helps uncover fraud, deceit and forgery often providing key evidence in criminal and civil law.	Identification of Handwriting- general characteristics, natural variations, fundamental divergences and individual characteristics. Examination of additions, alterations and obliterations in the documents.

3	**Crime scene management:** Crime scene management is a critical part of forensic science, ensuring that evidence is properly preserved, documented, and collected for accurate analysis. Effective C.S.M. is essential for successful forensic investigation, as it forms the foundation for all further analysis and legal proceedings.	To sketch and photograph the scene of crime. To collect and pack physical clues at the scene of crime. Draw a fine sketch of an indoor scene & outdoor scene of crime.
4	**Cyber forensic:** Cyber forensic also known as digital forensic is a key branch of forensic science focused on the investigation of crimes involving digital device & Data.	Use of Internet–Visiting websites with given URL, searching information using search engine. Use of E – mail – Creating e – mail ID, sending & receiving e – mails with attachments.

Suggested reading:

1. Richard Saferste in; Forensic Science hand Book; Ed.; Prentice-Hall, Englewood Cliff, New Jersey
2. J. Robertson. Forensic examination of glass and pain. C. R.C Press L.L.CUS
3. Forensic science in India and the world; Deepak Ratan, mohd. h. zaidi,2008
4. The practice of crime scene investigation; John horsweel,2004
5. Crime scene processing; Ralph. e. williams,2009
6. Crime scene investigation; Thomas. f. adams,2000
7. Fire investigation; Niamhnicdaeid,2004
8. Spot test in organic analysis; Fritz feigl,2005
9. Essential forensic biology; Alan gunn,2009
10. Blood stain pattern analysis; Tom bevel, RossM.gardner,1997
11. Spot test in Inorganic analysis,6thedition;2005
12. Forensic Entomology; Dorothy E. gennard,2007
13. Basic gas Chromatography, 2nd edition; Harold M. mcnair, James M. miller,2010
14. Forensic Science in criminal Investigation; B. R. sharma,2010
15. Instrumental method of chemical analysis; Gurdeep R. chatwal, sham K. anand,2008
16. Forensic science, 2nd edition; Stuart H. james, jon J. norahy,2000
17. Firearms in criminal investigations and trials; B.R. Sharma,2002
18. Toxicology and Forensic Medicine by Apurba Nandy.
19. Medical Jurisprudence and Toxicology,23rd edition; K. M. athiharan,2009
20. Principles of Genetics,5th edition; D. peter, Michaelj. simmons,2009
21. Criminal Investigation; Paul B. weston, Char lescushbaugh, Kenneth,2000
22. Forensic Examination of fibers 2nd edition";James Roberson, Michaelgrieve,2009
23. Scientific and legal application of blood stain pattern interpretation; Stuart H. james,1999

BHAKTA KAVI NARSINH MEHTA UNIVERSITY
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SEMESTER-VI

Course Level	5.5		**Internal Marks**	50
Program	**B.Sc. (Honors)**		**External Marks**	50
Semester	VI		**Practical Internal**	50
Category of Course	Minor - 6		**Practical External**	50
Course Credit	4 (2T+2P)		**Prac. External Exam Duration**	-
Teaching Hours	2T+4P		**Total**	100
Course Code			**Exam Duration**	**02:00 Hrs**
Course Title	Minor Chemistry-6			

Theory Course content Objectives:

- Principle of Inorganic Qualitative Analysis: To Develop the ability to understand the concepts behind identification and separation of inorganic mixture containing four radicals.
- Gravimetric Exercises: To understand the basic principles of estimating metal ions using Gravimetric exercises. Learn to choose appropriate precipitating agent and method to generate accurate result. Also understand all the steps involved in gravimetric analytical process.
- Fertilizer: Know different types of nutrients, their sources and importance. Types of fertilizers, its classification and source of availability. Methods of synthesis and applications, sustainable usage to ensure long-term agricultural productivity.

Practical Course component Objectives:

- This course also aims to enhance students' analytical skills through laboratory work, emphasizing accuracy, precision, and problem-solving in chemical analysis.

Course Learning Outcomes: Upon completing the course, students will be able to:

- Independently carry out inorganic qualitative analysis of salts and mixtures containing four radicals.
- Independently carry out estimation of amount of metal in a mixture of metal using the most accurate quantitative analytical method like gravimetric analysis.
- Understand chemistry of fertilizers and apply their knowledge in identification, synthesis and end use of it.
- These outcomes ensure students gain practical expertise in chemical analysis, preparing them for advanced research and industry-related applications.

Course Contents:

Sem.	Unit No	Syllabi	Teaching Hours
6	1	**Principle of Inorganic Qualitative Analysis**: Introduction, Preparation of Original Solution (OS), Concept of classification of cations (IP and Ksp) and role of Group reagents and common ion effect. Interfering ions and its remedies. Explanation with chemical equations for the following A. Dry test for positive radicals (1) Charcoal test, (2) Cobalt nitrate test & (3) Flame test. B. Dry test for negative radicals (including use of various reagent papers)	**7T**
	2	**Principle of Gravimetric analysis:** Introduction, Von Weimarn ratio, Precipitation methods, Important aspects of gravimetric analysis, conditions for precipitation, Types of Precipitates and characteristics, Co-Precipitation and Post precipitation, Completeness of precipitation, Effect of pH and Temperature on solubility, Remedies of Peptization and occlusion, Purity of ppt, Super saturation, Coagulation. Filtration, Washing, Drying, Incineration, Importane of filter paper, Important Aspects of Gravimetric analysis of Ba+2as $BaSO_4$, Al+2 as Al_2O_3, Ni+2as Ni(DMG)2, Fe+2 as Fe_2O_3	**8T**
	3	**Chapter - 3 Fertilizers-1** Introduction, Types of Plant nutrients(Primary, secondary and micro), Criterion or good fertilizer, Role of various plant nutrients, Classification of fertilizers based on mode of operation and source (Natural and synthetic), Natural organic and inorganic fertilizers, Synthetic fertilizers, Nitrogenous fertilizers: **1) Ammonium nitrate:** (i) Manufacture by Prilling method (ii) Manufacture by Stengel method **2) Ammonium sulphate:** (i) Manufacture from gypsum (Sindri Process) & Action as fertilizer **3) Urea:** (i) Manufacture from Ammonium carbide (ii) Manufacture by Sindri process & Action as fertilizer **3) Calcium cyanamide:** (i) Manufacture & Action as fertilizer	**8T**

	4	**Chapter - 4 Fertilizers-2** **1) Phosphate fertilizer** (i) Manufacture of Normal super phosphate (ii) Manufacture of Triple super phosphate **2) Ammonium Phosphate:** (i) Manufacture of Mono ammonium phosphate (ii) Manufacture of Diammonium phosphate **3) Potassium fertilizer:** Potassium chloride, Potassium sulphate and Potassium nitrate. Mixed or multi nutrient fertilizers (NPK), Comparison of advantages and disadvantages of natural and synthetic fertilizers.	**7T**

Minor Chemistry Practical-6

Sem	Unit No	Syllabi	Teaching Hours
6	**1**	**Inorganic Qualitative Analysis(Four radicals)** Toidentify2-positiveand2-Negativeradicalsfromthegiveninorganicmixture containing total fourradicals. ***[7inorganicmixturesmaybeanalysed]***	**30**
	2	**Gravimetric Analysis:** Minimum six Gravimetric analysis exercises with three containing impurities of Cu or Fe and three pure solutions may be given. 1. Estimation of nickel (II) in a mixture of solution containing $NiSO_4$, $CuSO_4$ and free H_2SO_4 as $Ni(DMG)_2$ complex using Dimethylglyoxime (DMG). 2. Estimation of copper as CuSCN 3. Estimation of Fe^{+2} as Fe_2O_3 in a solution containing a (mixture of $CuSO_4$ and) $FeSO_4$ NH_4SO_4 by precipitating iron as $Fe(OH)_3$. 4. Estimation of Al (III) from the solution mixture containing $CuSO_4$ $AlSO_4$ and H_2SO_4 as Al_2O_3 or by precipitating with oxine and weighing as Al(oxine)3 (aluminium oxinate) 5. Estimation of Ba as $BaSO_4$ in a mixture of solution containing $BaCl_2$, $FeCl_3$ and HCl. 6. Estimation of Mn in a mixture of solution containing $MnCl_2$, $CuCl_2$ and HCl as $Mn_2P_2O_7$. 7. Estimation of Zn in a mixture of solution containing $ZnSO_4$, $CuSO_4$ and H_2SO_4 as $Zn_2P_2O_7$.	**30**

Suggested Reading:

1. Principles of Inorganic chemistry – Puri, Sharma & Kalia
2. Concise Inorganic Chemistry - J. D. Lee
3. Advanced Inorganic Chemistry- Cotton and Wilkinson
4. Basic Inorganic Chemistry - Gurdeep & Chatwal
5. A Text Book of Organic Chemistry (II Edition) by Raj K. Bansal
6. Essentials of Physical Chemistry, B. S. Bahl, G. D. Tli and Arun Bahl, S. Chand & Co. New Delhi
7. Elements of Physical Chemistry, Late B.R. Puri, L. R. Sharma and Madan
8. Pathania, Vishal Publishing Co. Jalandhar
9. Principles of Physical Chemistry, Samule H. Maron and Carl F. Prutton, Oxford & IBH Publishing Co. Pvt. Ltd. New Delhi
10. Physical Chemistry, B. K. Sharma, Goel Publication House. Meerut.
11. Elements of Physical Chemistry, Samuel Glasstone and David Lewis, Macmillan & Co.
12. Industrial Chemistry by B.K. Sharma
13. A Textbook of Quantitative Inorganic Analysis by A. I. Vogel
14. Inorganic inflictive analysis by Vogel and Gehani Parekh
15. Photochemistry and Pericyclic reactios by Jagdambasingh and Jayasingh 6th edition ISBN:9360742724
16. Organic chemistry by Clayden Greeves and warren ISBN: 10: 9780198728719
17. Spectroscopy of organic compounds by P.S. Kalsi.ISBN-10:9360745162
18. Spectrometric identification of Organic Compounds by *Robert M. Silverstein* et al, Wiley publication

Evaluation scheme

INTERNAL EVALUATION SCHEME (50 Marks) for 04 Credits 100 Marks (Theory/Practical) course		
NO	**Particulars**	**Marks**
1	**Mid Semester (Theory/Practical) Exam (Mandatory)**	**25**
2	Class Test	05
3	Open book exam/test	05
4	Open note exam/test	05
5	Self-test/ Online test	05
6	Quizzes/Objective test	05
7	Class assignment	05
8	Home assignment	05
9	Research/Dissertation	05
10	Viva/Oral exam	05
11	Group Discussion	05
12	Paper presentation/Seminar	05
13	Co-curricular work	05
14	Field Assignment	05
15	Poster Presentation	05
16	Attendance	05
17	Project Work	05
	Total	**50**

Note: Sr.No.1 is mandatory. Select any five from Sr.No.2 to 17 Each Contains five marks. Student should secure 18 Marks for passing in internal Exam. (Choose particular exam style based on type of course-i.e; Theory or practical).

For Major paper 14, 15: 25 marks Mid-term theory exam + 25 CCE + 50 External Theory Exam (SEE) = 100 marks

For Major paper-16(Practical): 25 marks Mid-term (practical exam) + 25 CCE + 50 External Practical Exam (SEE) = 100 marks

For Minor paper-6: 25 marks Mid-term (practical exam) + 25 CCE (Practical) + 50 External (Theory Exam) = 100 marks

Paper Style
For each theory paper following Pattern of the external examination

Ques. No.	Particulars	From which Unit	Marks
1	Any Two out of Three Questions	1	10
2	Any Two out of Three Questions	2	10
3	Any Two out of Three Questions	3	10
4	Any Two out of Three Questions	4	10
5	Any Two out of Four Questions	One from Each Unit	10
		Total Marks	50

Paper Style External Practical Exam

Exercise	Particulars	Time	Marks
1	Session-1	2.5 Hours	25
2	Session-2	2.5 Hours	25
		Total	50