પરિપત્ર:

ભક્તકવિ નરસિંહ મહેતા યુનિવર્સિટીની સાયન્સ વિદ્યાશાખાનાં અભ્યાસક્રમ ચલાવતી તમામ સંલગ્ન કોલેજોનાં આચાર્યશ્રીઓને સવિનય જણાવવાનું કે સાયન્સ વિદ્યાશાખા હેઠળનો NEP-૨૦૨૦ અંતર્ગતનો ફોરેન્સિક સાયન્સ વિષયનો (બી.એસ.સી. વિથ ઓનર્સ) નો સેમેસ્ટર-૨ નો અભ્યાસક્રમ આ સાથે સામેલ છે.

માનનીય કુલપતિશ્રીની મંજુરી અનુસાર સદર અભ્યાસક્રમ શૈક્ષણિક વર્ષ જુન,૨૦૨૩થી અમલવારી કરવાની રહે છે. સાયન્સ વિદ્યાશાખાનાં અભ્યાસક્રમ ચલાવતી તમામ સંલગ્ન કોલેજો ધ્વારા તેની અમલવારી કરવા જણાવવામાં આવે છે.

Bhakta Kavi Narsinh Mehta University Junagadh.

13/02/2024

ખાસ ફરજ પરના અધિકારી
(એકેડેમિક)

ક્રમાંક/બીકેએનએમયુ/ એકેડેમિક/૩૩૩/૨૦૨૪
ભક્તકવિ નરસિંહ મહેતા યુનિવર્સિટી,
સરકારી પોલીટેકનિક કેમ્પસ,
ભક્તકવિ નરસિંહ મહેતા યુનિવર્સિટી રોડ,
ખડીયા, જૂનાગઢ-૩૬૨૨૬૩
તા.૧૩/૦૨/૨૦૨૪

પ્રતિ,

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

નકલ સાદર રવાનાઃ-

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

નકલ રવાના જાણ તથા યોગ્ય કાર્યવાહી અર્થેઃ

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

Bhakta Kavi Narsinh Mehta University
Junagadh

BOARD OF FORENSIC SCIENCE
FACULTY OF SCIENCE
SYLLABUS FOR
BACHELOR OF FORENSIC SCIENCE
(HONOURS) PROGRAMME
(SEMESTER - II)
EFFECTIVE FROM JUNE, 2023

Preamble

This National Education Policy 2020 is the first education policy of the 21st century and aims to address the many growing developmental imperatives of our country individual. It is based on the principle that education must develop not only cognitive capacities - both the 'foundational capacities' of literacy and numeracy and 'higher-order' cognitive capacities, such as critical thinking and problem solving – but also social, ethical, and emotional capacities and dispositions.

The rich heritage of ancient and eternal Indian knowledge and thought has been a guiding light for this Policy. The pursuit of knowledge (Gyan), wisdom (Pragyaa), and truth (Satya) was always considered in Indian thought and philosophy as the highest human goal. The aim of education in ancient India was not just the acquisition of knowledge as preparation for life in this world, or life beyond schooling, but for the complete realization and liberation of the self. World-class institutions of ancient India such as Takshashila, Nalanda, Vikramshila, Vallabhi, set the highest standards of multidisciplinary teaching and research and hosted scholars and students from across backgrounds and countries. The Indian education system produced great scholars such as Charaka, Susruta, Aryabhata, Varahamihira, Bhaskaracharya, Brahmagupta, Chanakya, Chakrapani Datta, Madhava, Panini, Patanjali, Nagarjuna, Gautama, Pingala, Sankardev, Maitreyi, Gargi and Thiruvalluvar etc.

Over the past decades the higher education system of our country has undergone substantial structural and functional changes resulting in both quantitative and qualitative development of the beneficiaries. The upgradation of undergraduate programmes in the line of NEP, 2020 will play an extremely important role in promoting human as well as societal well-being and in developing India as envisioned in its Constitution - a democratic, just, socially conscious, cultured, and humane nation upholding liberty, equality, fraternity, and justice for all. A holistic and multidisciplinary education would aim to develop all capacities of human beings -intellectual, aesthetic, social, physical, emotional, and moral in an integrated manner. Such an education will help develop well-rounded individuals that possess. Such changes will further result in learning outcome-based curriculum to maximize the benefits of the newly designed curriculum. The learning outcome-based curriculum in general and in Forensic Sciences will definitely help the teachers of the discipline to visualize the curriculum more specifically in terms of the learning outcomes expected from the students at the end of the instructional process. It is pertinent to mention here that the purpose of education is to develop an integrated personality of the individual and the educational system provides all knowledge and skills to the learner for this. The template of learning outcome-based framework has categorically mentioned very well-defined expected outcomes for the program like core competency, communication skills, critical thinking, affective skills, problem-solving, analytical, reasoning, research-skills, teamwork, digital literacy, moral and ethical awareness, leadership readiness and so on along with very specific learning course outcomes at the starting of each course. Therefore, this template on Learning Outcomes based Curriculum Framework (LOCF) for B.Sc. with Forensic Sciences/Forensic Sciences Honours under the University will be in the line of NEP, 2020 – more flexible, multi-disciplinary, holistic and will definitely be a landmark in the field of outcome-based curriculum construction.

Forensic Science is the use of scientific procedures and the examination of scientific information to assist the legal and law enforcement systems. Bachelor's degree programs in Criminology and Forensic science offer a well-balanced education in science, including statistics, biology, chemistry, and physics. Bachelor's degree programs in Forensic Science combine lecture and laboratory classes and may include internships and exposure to Forensics Science Laboratories (FSL's) and related agencies. This program is designed to introduce students to Forensic Science and its interdisciplinary nature through an exploration and examination of Forensic sub-disciplines and emerging techniques including Forensics Medicine, Forensic Chemistry, Forensic Physics, Forensic Fingerprinting, Cyber Security and among others. Beyond providing

students with a broad overview of Forensic Science, students will be encouraged to explore and develop their own specific interests within the field. All these aspects have been given due weightage over the eight semesters. It is essential for the undergraduate students to acquaint themselves with various tools and techniques for exploring the field of Forensic Sciences. Papers on this aspect are proposed to provide such an opportunity to the students before they engage themselves with the learning of modern tools and techniques in Forensic Sciences. Keeping the employment entrepreneurship in mind, applied courses have also been introduced. These courses shall provide the Forensic Sciences students with hands-on experience and professional input. On the whole, the curriculum is a source of lot of information and is supported by rich resource materials. It is hoped that a student graduating in Forensic Sciences with the new curriculum will be a complete Forensic Sciences at Honours level.

This National Education Policy envisions an education system rooted in Indian ethos that contributes directly to transforming India, that is Bharat, sustainably into an equitable and vibrant knowledge society, by providing high-quality education to all, and thereby making India a global knowledge superpower. The Policy envisages that the curriculum and pedagogy of our institutions must develop among the students a deep sense of respect towards the Fundamental Duties and Constitutional values, bonding with one's country, and a conscious awareness of one's roles and responsibilities in a changing world. The vision of the Policy is to instill among the learners a deep-rooted pride in being Indian, not only in thought, but also in spirit, intellect, and deeds, as well as to develop knowledge, skills, values, and dispositions that support responsible commitment to human rights, sustainable development and living, and global well-being, thereby reflecting a truly global citizen. We tried our level best to fulfill the vision of NEP by providing Forensic Sciences syllabus for first year students to transform our Indian knowledge system with modern concept of Forensic Sciences. The new curriculum of B.Sc. in Forensic Sciences offers essential knowledge and technical skills to study Forensic Sciences used in the legal or justice system to support and uphold the law. When a crime has been committed and evidence is collected at the scene, scientists analyze it, arrive at scientific results and give expert court testimony about their findings. Forensic science concentrates on facts that prove something did or did not happen in a criminal or civil case.

The curriculum framework considers the need to maintain globally competitive standards of achievement in terms of the knowledge and skills in Forensic Science and allied courses, as well develop scientific orientation, spirit of enquiry problem, solving skills and, professional values which foster rational and critical thinking in the students. B.Sc. Forensic Sciences Program covers academic activities within the classroom sessions along with practical concepts at laboratory sessions. Infield, outstation activities and projects are also required to be organized for real-life experience and learning. Candidates who have curiosity in Crime Scene Investigation, Forensic Cyber Security, Forensic Fingerprinting, or wish to work as researchers or professions like Forensic Scientists, Investigating Officer, Forensic Expert, etc. can choose B.Sc. Forensic Science course.

SEMESTER-2

SN	Category of Course	Title of the Course	Course Credit
1	Major - I (Discipline Specific Core Courses)	Major-1 (Theory + Practical) [Forensic Science]	4 (3+1)
2	Major - II (Discipline Specific Core Courses)	Major-2 (Theory + Practical) [Forensic Science]	4 (3+1)
2	Minor (Discipline Specific Minor Courses)	Minor-1 (Theory + Practical) [Chemistry]	4 (3+1)
3	Multidisciplinary course	MDC-1 (Theory + Practical) [Physics]	4 (3+1)
4	Ability Enhancement Course (AEC)	AECC-201:Foundation English	02
5	Skill Enhancement Course (SEC)/Internship	SEC-201 [Application of Separation techniques in Forensic Chemistry] (All Board shall prepare Course Basket)	02
6	Value Added Course (VAC)	VAC-201: Environmental Studies	02
		Total	**22**

Conceptual Framework for SEM-2

SEMESTER - 2

Course Type	Course Code	Credit	Work Hours/ Week	External Exam Hours	Marks		Total
					Internal	External	
Discipline Specific Core Courses (Theory)-I	DSCFS-201	3+1	3+2	2	50	50	100
Discipline Specific Core Courses (Theory)-II	DSCFS-202	3+1	3+2	2	50	50	100
Discipline Specific Minor Courses Chemistry (Theory)	DSMFS-201	3+1	3+2	2	50	50	100
Multidisciplinary Courses Physics (Theory)	MDCFS-201	3+1	3+2	2	50	50	100
Ability Enhancement Courses	AECC-201	2	3(1 T + 2 P)	2	25	25	50
Skill Enhancement Courses	SECFS-201	2	4 (Only P)	3	25	25	50

Pattern of Examination:

Students will have to attend theory and practical both during the semester and at the end of semester, University exams will be conducted. Examination contains 70% external and 30% internal marks. A student's performance during every practical session is assessed and marks for a maximum of 15 are recorded. External practical evaluation will carry 35 marks, so total 50 marks for each practical per paper examination will be counted. Internal assessment for theory can be following any one as mentioned below.

Total Scheme of evaluation

Semester	Total distribution of mark						
	Internal					External	Total
	Exam	Assignment	MCQ	Attendance	Practical		
II	10	10	05	05	20	50	100

BHAKT KAVI NARSINH MEHTA UNIVERSITY - JUNAGADH

THEORY EXAMINATION

SEMESTER –II

FORENSIC SCIENCE

Paper No. DSCFS201 - III: General Concept of Spectroscopic Techniques

Paper No. DSCFS202 - IV: General Principles of Biology/Bio-Chemical Analysis

Time: 2 Hours **Total Marks: 50**

Instructions:

1. This question paper contains **five** questions. **All** questions are compulsory.
2. Write answers to **all** the questions in main answer sheet.
3. Draw neat and labelled diagram wherever necessary.
4. Figures to the right side indicate full marks for the question.

EXTERNAL ASSESSMENT BY UNIVERSITY		
Que. No.	**Particulars**	**Marks**
Que-1	**(From UNIT-1)** Answer any one in detail: (**Any One**)	**10**
Que-2	**(From UNIT-2)** Answer any one in detail: (**Any One**)	**10**
Que-3	**(From UNIT-3)** Answer any one in detail: (**Any One**)	**10**
Que-4	**(From UNIT-4)** Answer any one in detail: (**Any One**)	**10**
Que-5	**(From Any UNIT)** Answer any one in detail: (**Any One**)	**10**

Program Outcome (PO):

- ☞ The University is on its way to start with four-year course B.Sc. programme in Forensic Sciences, in line with new government education Policy to uproot the Forensic experts from undergraduate level.
- ☞ Forensic sciences program is to develop professional, ethical graduates whose competence in problem-solving, legal analysis and application, quantitative reasoning, investigation, and scientific laboratory procedures can be applied to immediate employment or advanced study.
- ☞ The curriculum of the programme is designed in such a way that it will not only foster laboratory skills but also strengthen the knowledge of basic sciences viz. Chemistry, Physics, & Biology.
- ☞ The programme aims to provide a wide vision and knowledge to the students in the field of forensic science which will promote truth and justice in our community, state, and nation.
- ☞ This comprehensive program incorporates a unique curriculum that balances knowledge and practice through in field Crime Scene Investigations.
- ☞ B.Sc. Forensic Sciences composed of different courses like Criminal law, Crime and Society, Forensic Psychology, Crime Scene Management, Biometrics, Questioned Documents, Forensic Dermatoglyphics which are theoretical curriculum for students.
- ☞ Indoor and outdoor Crime scene Investigation techniques to handle the evidence, maintaining chain of Custody, handling, and packaging of evidence, Toxicological, Biological, Chemical are the practical subject area of the course.
- ☞ During the investigating process, forensic equipment is used to process samples and evidence to solve crimes.

Course Outcome (CO):

The CO for B.Sc. Forensic Science program is as follows:

- ☞ Understand the concepts of basic and applied sciences including psychology and its applications in forensics.
- ☞ Analyse the sample in field and laboratory test of crime exhibits with the latest norms and standards.
- ☞ Analyse the different crime scenario and make decision regarding analysis of crime exhibits.
- ☞ Evaluate the various results and presenting into the court of law on requirements.
- ☞ Understand the basic and advanced techniques in various disciplines of forensic science.
- ☞ Analyse the forensic samples using different techniques of various disciplines of forensic science.
- ☞ Evaluate the results of various techniques and make decisions on simple or complex forensic problems.
- ☞ Design and develop research-based solutions of complex forensic problems.
- ☞ On completion of the programme students will apply the Laboratory skills to participate in the career needs of Forensic community.
- ☞ Become trained in the laboratory skills of different division of Forensic Science and will be able to work with different Research & Development organizations.
- ☞ Forensic ballistic is used in analysis of fired bullet, cartridge case and its impact to determine information about firearm and comparison purpose.
- ☞ Forensic question document is used in analysis of document either it is genuine or forged and is any addition or alteration or obliteration is present in document or not.
- ☞ Forensic psychology is the practice of psychology applied to the law. It is the application of scientific knowledge and method to help answer legal question arising in civil, contractual, or other judicial proceedings.

Program Specific Outcome (PSO):

- **Sem – 2**

In 2nd semester student:

- ☞ Understand basic concept of atomic and molecular spectroscopy and forensic application of it.
- ☞ Study about different spectroscopy like UV spectroscopy, X- Ray spectroscopy.
- ☞ Understand biological analysis technique like pH and buffer solution, Centrifugation techniques.
- ☞ Understand the application of Separation techniques in Forensic Chemistry

Bhakta Kavi Narsinh Mehta University
Syllabus of Bachelor of Science (B.Sc) as per NEP
Syllabus of Sem-2
Effective from June, 2023
Subject: Forensic Science

Course Level	4.5		**Course Code**	DSCFS201
Programme	B.Sc (Forensic Science)		**Internal Marks**	50
Semester	2		**External Marks**	50
Course Type	Major-1		**Practical Internal**	00
Course Title	General Concept of Spectroscopic Techniques		**Practical External**	00
Course Credit	04 (3 T + 1 P)		**Total**	100
Teaching Hours	75		**Exam Duration**	2:00 Hrs.

Unit – I Basic Concepts - Atomic & Molecular Spectroscopy

I.1 What is spectroscopy, electromagnetic spectrum?

I.2 Interaction of radiation with matter: reflection, absorption, transmission, fluorescence, phosphorescence and their forensic applications, radiation filters

I.3 Atomic spectra, energy levels, quantum numbers and designation of states, selection rules, qualitative discussions of atomic spectra

I.4 Molecular spectra: qualitative discussions of molecular binding, molecular orbital, types of molecular energies

Unit – II UV – SPECTROSCOPY

II.1 Introduction and theory of UV spectroscopy, Instrumentation of UV spectroscopy, its types,

II.2 Possible Transaction, Application of UV Spectroscopy

Unit – III INFRA-RED, FT-IR & RAMAN SPECTROSCOPY

III.1 Introduction to IR, theory of IR, Molecular vibration & its types, Degree of freedom, Instrumentation of IR Spectroscopy, qualitative discussion of spectra of atomic & polyatomic molecules.

III.2 Fourier Transformer Infrared Spectroscopy (FTIR), working & its application

III.3 Introduction to Raman Spectroscopy, its types, Instrumentation & its applications.

Unit – IV Elements of X - Ray Spectrometry

III.1 X -Rays sources for radiations (X-ray tubes) radioactivity,

III.2 Elements of X - ray spectrometry- fluorescence, energy Dispersive X-ray analysis (EDX), wavelength Dispersive X-ray analysis (WDX),

III.3 X-ray Absorption, X-ray diffraction, X-ray fluorescence,

III.4 Augur effect

Suggested Experiments

1. To study the properties of light -
   (a) Reflection,
   (b) Absorption,
   (c) Transmission,
   (d) Fluorescence
2. To determine the UV-maxima for different compounds.
3. Verification of Beer's and Lambert's Law.
4. To determine the IR absorption for different compounds.
5. To study Photographic detector & Photoelectric detector.

Bhakta Kavi Narsinh Mehta University
Syllabus of Bachelor of Science (B.Sc) as per NEP
Syllabus of Sem-2
Effective from June, 2023
Subject: Forensic Science

Course Level	4.5		**Course Code**	DSCFS202
Programme	B.Sc (Forensic Science)		**Internal Marks**	50
Semester	2		**External Marks**	50
Course Type	Major-2		**Practical Internal**	00
Course Title	General Principles of Biology/Bio-Chemical Analysis		**Practical External**	00
Course Credit	04 (3 T + 1 P)		**Total**	100
Teaching Hours	75		**Exam Duration**	2:00 Hrs.

Unit-I pH AND BUFFER SOLUTIONS

I.1 Introduction, Definition, pH Scale, Applications

I.2 What is Buffer Solution, Buffer Capacity, Types of Buffers, Uses

I.3 pH Meter, Working and its application.

Unit-II CENTRIFUGATION TECHNIQUES

II.1 Basic principles of sedimentation,

II.2 Various types of Centrifuges & Centrifugations, Analytical centrifugation, Preparative centrifugation, Ultra-centrifuge - Refrigerated Centrifuges

III.3 Analysis of sub-cellular fractions

Unit-III MACROMOLECULES

III.1 Carbohydrates: Classification, Types, Properties, Significance

III.2 Proteins: Classification, Structures, Properties, Significance

III.3 Lipid: Classification, Types, Properties, Significance

III.4 Nucleic Acid: Classification, Types, Properties, Significance, Structures

Unit – IV BLOOD PHYSIOLOGY

IV.1 Introduction, Definition, Types of Blood Cells

IV.2 Components of Blood, Blood vessels & its Types

IV.3 Functions of Blood

IV.4 Blood Disorder & its treatment.

Suggested Experiments

1. To prepare the phosphate buffer of different pH and measure the pH of given solution with pH meter.
2. To study types of Centrifuges.
3. To make qualitative test for Proteins.
4. To make qualitative test for Carbohydrates & Lipids
5. To make separation of Blood Sample by Centrifugation Technique.

Bhakta Kavi Narsinh Mehta University
Syllabus of Bachelor of Science (B.Sc) as per NEP
Syllabus of Sem-2
Effective from June, 2023
Subject: Forensic Science

Course Level	4.5		**Course Code**	
Programme	B.Sc (Forensic Science)		**Internal Marks**	25
Semester	2		**External Marks**	25
Course Type	Skill Enhancement Course		**Practical Internal**	00
Course Title	Separation Techniques CHROMATOGRAPHY		**Practical External**	00
Course Credit	02		**Total**	50
Teaching Hours	60 Hrs.		**Exam Duration**	3:00 Hrs.

Separation Techniques: CHROMATOGRAPHY

→ Chemical separation techniques: Chromatography

→ Chromatographic techniques: General principles and function of chromatography

- Paper chromatography
- Column chromatography
- TLC
- Adsorption chromatography
- Partition chromatography
- Gas chromatography
- Gas - liquid chromatography
- Ion-exchange chromatography
- Exclusion (permeation) chromatography
- Affinity chromatography, HPLC

→ Uses of Chromatography

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