UNIVERSITY OF CALICUT

Abstract

General and Academic -B.Voc Programme in Forensic Science under modified B.Voc Regulations 2014 - Scheme and Syllabus-Approved-Implemented w.e.f 2018 admissions-Orders issued.

G & A - IV - J

U.O.No. 3029/2019/Admn Dated, Calicut University.P.O, 27.02.2019

Read:-1. U.O.No. 7404/2018/Admn dated 19.06.2018.
2. Item No.1 in the minutes of the B.Voc Regulations Committee held on 13.09.2018.
3. Request from the Convenor, B.Voc Regulations Committee dated 06.10.2018.
4. Item No.2 in the minutes of the Board of Studies in Forensic Science held on 08.11.2018.
5. Item No.I.5 in the Minutes of Faculty of Science held on 05.12.2018.
6. Item No.II.F.5 in the Minutes of Academic Council held on 18.12.2018.

ORDER

The modified B.Voc Regulations has been implemented vide paper read as (1) and vide paper read as (2) the B.Voc Regulations Committee decided to place the Syllabi of new B.Voc Programmes which are sanctioned by UGC, in various Colleges under University of Calicut, before various Boards of Studies for approval.

The Convenor, B.Voc Regulations Committee vide paper read as (3), pointed out that UGC has directed to start the newly sanctioned Programmes without delay and hence requested to initiate urgent steps to approve the Syllabi of the newly sanctioned B.Voc Programmes at various Colleges with a suggestion to submit the Syllabi to the Chairmen of Boards of Studies concerned with a request to approve the Syllabi in circulation with other Board members (as provided under CUFS 1976) and the same has been approved by Vice Chancellor.

Accordingly , the Syllabus of B.Voc Programme in Forensic Science was forwarded to the Chairman, Board of Studies in Forensic Science. The Board of Studies in Forensic Science approved the Syllabus for B.Voc Programme in Forensic Science vide paper read as (4). Vide paper read as (5), the Faculty of Science and vide paper read as (6), the Academic Council has approved the same.

Sanction, has therefore been accorded for implementing the Scheme and Syllabus of B.Voc Programme in Forensic Science under modified B.Voc Regulations 2014, in the University w.e.f 2018 admissions.

Orders are issued accordingly. (Syllabus is appended herewith).

Biju George K

Assistant Registrar

To

Principals of the Colleges offering B.Voc Programme in Forensic Science.

Copy to: PS TO VC/PA to R/PA TO CE/JCE VII/JCE I/GA I F/Library/SF/DF/FC.

Forwarded / By Order

Section Officer

UNIVERSITY OF CALICUT

B. Voc. PROGRAMME IN FORENSIC SCIENCE (2018 Admn onwards)

Eligibility

- The Eligibility for B.Voc Forensic Science programme is Plus Two (HSE/CBSE/ICSE/VHSC) in science stream with Biology and chemistry as a compulsory subject. The index mark is calculated as per the University for UG admissions.
- The admission to B.Voc will be as per the rules and regulations of the University for UG admissions.
- The eligibility criteria for admission shall be as announced by the university from time to time.
- Separate rank lists shall be drawn up for reserved seats as per the existing rules.
- Grace marks may be awarded to a student for meritorious achievements in co-curricular activities such as Sports/Arts/NSS/NCC/Student Entrepreneurship.

Institutional visits

During the course period, students are required to visit various institutions related with the forensic studies. A report of the institutional visits with the dated signature of the teacher concerned and duly certified by the Head of the Department shall be submitted at the time of practical examinations along with the practical record. No mark shall be awarded for the record without Institutional Visit Report.

Internship and Project

1. There will be an internship for 3 months and a project for 3 months (a total of six months)
2. A maximum of ten students (group project) will be assigned an internal guide, allotted from the parent department or an expert available in the college appointed by the principal or the Head of the Department.
3. The students have to make regular discussions with the guide while choosing the subject/area and throughout the lifetime of the project.
4. An evaluation team is constituted for conducting the evaluation. The team consists of external examiner, allotted by the University from the approved examination panel, and a faculty. No internal marks are awarded in internship and project.
5. Students should submit a report of their work. A valid certificate from the organization should be produced as a proof that the work is done in the respective organization.
6. A viva will be conducted based on the report and the students are supposed to clarify the questions regarding their project work.
7. Mark distribution for project assessment

Distribution	Marks
Content and relevance of dissertation	30
Viva	20
Presentation	10

DISTRIBUTION OF SUBJECTS AND MARKS

1st semester								
	Course No.	COURSE CODE	PAPER	APPROVED BY	CREDIT	MARKS		
						Internal	External	Total
1	1.1	GEC1EG01	Transactions Essentials English language and Skills. A01	BOS University of Calicut	4	20	80	100
	1.2	GEC1ML02	Malayalam- Bhashayum sahithyavum I MAL1 A01(2)	BOS University of Calicut	4	20	80	100
	1.3	GEC1CH03	General Chemistry (CHE1C01)	BOS University of Calicut	4	20	80	100
	1.4	SDC1FS01	Fundamentals of Forensic Science		4	20	80	100
	1.5	SDC1IC02	Indian Constitution, Criminal Major & Minor Acts		4	20	80	100
	1.6	SDC1FS03(P)	Fundamentals of Forensic Science		5	20	80	100
	1.7	SDC1IC04(P)	Indian Constitution, Criminal Major & Minor Acts		5	20	80	100
	TOTAL				30	700		

2nd semester								
2	2.1	GEC2EG04	Ways with Words. A02	BOS University of Calicut	4	20	80	100
	2.2	GEC2ML05	Malayalam-Bhashayumsahithyavum II MAL2A02(2)	BOS University of Calicut	4	20	80	100
	2.3	GEC2CH06	Organic chemistry (CHE3C03)	BOS University of Calicut	4	20	80	100
	2.4	SDC2FT05	Forensic Chemistry and Toxicology		4	20	80	100
	2.5	SDC2IT06	Instrumentation techniques		4	20	80	100
	2.6	SDC2FT07(P)	Forensic Chemistry, Toxicology		5	20	80	100
	2.7	SDC2IT08(P)	Instrumentation techniques		5	20	80	100
	Total				30			700
3rd semester								
3	3.1	GEC3EG07	Writing for academic and professional success. A03	BOS University of Calicut	4	20	80	100
	3.2	GEC3AE08	Arson and Explosives		4	20	80	100
	3.3	GEC3ZO09	Animal diversity and wildlife (ZO1CO1)	BOS University	4	20	80	100

				of Calicut				
	3.4	SDC3FP09	Forensic Physics		4	20	80	100
	3.5	SDC3FB10	Forensic Ballistics		4	20	80	100
	3.6	SDC3FP11(P)	Forensic Physics& Ballistics		5	20	80	100
	3.7	SDC3PR12(P)	Project/ Case study		5	20	80	100
	Total				30			700

4th semester

SEM NUM	Course No.	COURSE CODE	PAPER	APPROVED BY	CREDIT	MARKS		
						Internal	External	Total
4	4.1	GEC4EG10	Zeitgeist:- Readings on Society and Cultures.A04	BOS University of Calicut	4	20	80	100
	4.2	GEC4AV11	Forensic audio video analysis		4	20	80	100
	4.3	GEC4ZO12	Physiology, toxicology and ethology (ZO3CO3)	BOS University of Calicut	4	20	80	100
	4.4	SDC4FQ13	Forensic Dermatoglyphics and Questioned Documents		4	20	80	100
	4.5	SDC4CPV14	Criminology,Penology, Victimology and Forensic Psychology		4	20	80	100
	4.6	SDC4FQ15(P)	Forensic Dermatoglyphics,		5	20	80	100

			Questioned Documents					
	4.7	SDC4CPV16(P)	Criminology,Penology, Victimology and Forensic Psychology		5	20	80	100
	Total				30	700		
5th semester								
5	5.1	GEC5FM13	Forensic Medicine		4	20	80	100
	5.2	GEC5FBS14	Forensic Biology and Serology		4	20	80	100
	5.3	SDC5AP17	Advanced techniques in personal identification		4	20	80	100
	5.4	SDC5CT18	Crime Investigation Techniques		4	20	80	100
	5.5	SDC5CC19	Cyber crime and cyber forensics		4	10	40	50
	5.6	SDC5APCT20(P)	Advanced techniques in personal identificationCrime Investigation Technique		5	20	80	100
	5.7	SDC5CC21(P)	Cyber crime and cyber forensics		5	20	80	100
	Total				30	700		

6th semester								
6	6.1	SDC6ITPJ22	Internship and project		30	0	100	100
	Total				30			100
Total marks								3600
Total credits								180

FIRST SEMESTER B. Voc. DEGREE PROGRAMME (Theory)

FORENSIC SCIENCE

FUNDAMENTALS OF FORENSIC SCIENCE

Code: SDC1FS01

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

a. The significance of forensic science to human society.
b. The fundamental principles and functions of forensic science.
c. The divisions in a forensic science laboratory.
d. The working of the forensic establishments in India and abroad.

Module I:History and development of Forensic Science

Historical aspects of forensic science, Definitions and concepts of forensic science, Need of Forensic Science, Basic principles of Forensic Science, Functions of Forensic Science, Different branches of Forensic Science. Frye case and Daubert standard.

Module II:Legal aspects of crime

Crime – Introduction, Nature, causes and consequences of crime, Broad concepts of criminal Justice System, Procedures involved in the detection of crime, Filing of criminal charges, Indian police system – The police Act, Human rights and criminal justice system in India. Set up of INTERPOL.

Module III:Organizational set up of FSLs in India

Hierarchical set up of central forensic science laboratory, Hierarchical set up of state forensic science laboratory, Government examiners of questioned documents, Chemical examiners laboratory, Finger print bureaus, National crime records bureau, Bureau of police research and development, Mobile crime laboratory, Duties of forensic scientist, code of conduct of forensic scientists.

Recommended Reading:

1. B.B. Nanda and R.K. Tiwari, *Forensic Science in India: A Vision for the Twenty First Century*, Select Publishers, New Delhi (2001).
2. M.K. Bhasin and S. Nath, *Role of Forensic Science in the New Millennium*, University of Delhi, Delhi (2002).
3. S.H. James and J.J. Nordby, *Forensic Science: An Introduction to Scientific and Investigative Techniques*, 2nd Edition, CRC Press, Boca Raton (2005).
4. W.G. Eckert and R.K. Wright in *Introduction to Forensic Sciences*, 2nd Edition, W.G. Eckert (ED.), CRC Press, Boca Raton (1997).
5. R. Saferstein, *Criminalistics*, 8th Edition, Prentice Hall, New Jersey (2004).
6. W.J. Tilstone, M.L. Hastrup and C. Hald, *Fisher's Techniques of Crime Scene Investigation*, CRC Press, Boca Raton (2013).

FUNDAMENTALS OF FORENSIC SCIENCE (PRACTICAL)

Code: SDC1FS03(P)

1. To study the history of crime cases from forensic science perspective.
2. To cite examples of crime cases in which apprehensions arose because of Daubert standards.
3. To review the sections of forensic science at INTERPOL and compare with those in Central Forensic Science Laboratories in India. Include suggestions for improvements if any.
4. To study the annual reports of National Crime Records Bureau and depict the data on different type of crime cases by way of smart art/templates.
5. To write report on different type of crime cases.

6. To review how the Central Fingerprint Bureau, New Delhi, coordinates the working of State Fingerprint Bureaus.
7. To examine the hierarchical set up of different forensic science establishments and suggest improvements.
8. To examine the list of projects undertaken by the Bureau of Police Research and Development and suggest the thrust areas of research in Police Science.
9. To compare and contrast the role of a Police Academy and a Police Training College.
10. To compare the code of conduct prescribed by different establishments for forensic scientists.

FIRST SEMESTER B. Voc. DEGREE PROGRAMME (Theory)

FORENSIC SCIENCE

INDIAN CONSTITUTION,CRIMINAL MAJOR ACTS (IPC, Cr.PC, IEA)

Code: SDC1IC02

(36 hours) (2 hours per week) (2 Credits)

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

a. Constitution of India.
b. Criminal Major & Minor Acts.
c. Acts governing to social legislations.

Module I:Indian Constitution

Preamble, Fundamental rights, Directive principles of state policy, Fundamental Duties, The Union Judiciary, The State, The Union Territories, Relation between the Union & the State, Tribunals, Elections, Special Provision related certain classes, Emergency provisions and Schedules.

Module II: Criminal Major Acts

Classification – civil, criminal cases. Essential elements of criminal law.Constitution andhierarchy of criminal courts.Criminal Procedure Code.Cognizable and non-cognizable offences.Bailable and non-bailableoffences.Sentences which the court of Chief Judicial Magistrate may pass.Summary trials – Section 260(2).Judgements in abridged forms – Section

355.Indian Penal Code pertaining to offences against persons – Sections 121A, 299, 300, 302,304A, 304B, 307, 309, 319, 320, 324, 326, 351, 354, 359, 362.Sections 375 & 377 and their amendments.Indian Penal Code pertaining to offences against property Sections – 378, 383, 390, 391, 405,415, 420, 441, 463, 489A, 497, 499, 503, 511.Indian Evidence Act – Evidence and rules of relevancy in brief. Expert witness.Crossexamination and re-examination of witnesses.Sections 32, 45, 46, 47, 57, 58, 60, 73, 135, 136, 137, 138, 141.Section 293 in the code of criminal procedure.

Module III:Criminal Minor Acts and Social Legislations

Narcotic Drugs and Psychotropic Substances Act, Essential Commodity Act, Drugs and Cosmetics Act, Explosive Substances Act, Arms Act, Dowry Prohibition Act, Prevention of Food Adulteration Act, Prevention of Corruption Act, Wildlife Protection Act, I.T. Act, Environment Protection Act,Untouchability Offences Act, J.J Act, POCSO Act, KAAPA, SC & ST (Prevention of Atrocities) Act.

Recommended Reading:

1. D.A. Bronstein, *Law for the Expert Witness*, CRC Press, Boca Raton (1999).
2. Vipa P. Sarthi, *Law of Evidence*, 6th Edition, Eastern Book Co., Lucknow (2006).
3. A.S. Pillia, *Criminal Law*, 6th Edition, N.M. TripathiPvt Ltd., Mumbai (1983).
4. R.C. Nigam, *Law of Crimes in India*, Volume I, Asia Publishing House, New Delhi (1965).
5. (Chief Justice) M. Monir, *Law of Evidence*, 6th Edition, Universal Law Publishing Co. Pvt. Ltd., New Delhi (2002).

INDIAN CONSTITUTION,CRIMINAL MAJOR ACTS (IPC, Cr.PC, IEA)(PRACTICAL)

Code: SDC1IC04(P)

1. To study the powers and limitations of the Court of Judicial Magistrate of First Class.
2. To prepare a schedule of five cognizable and five non-cognizable offences.
3. To prepare a schedule of the offences which may be tried under Section 260(2) of Criminal Procedure Code.
4. To study a crime case in which an accused was punished on charge of murder under Section 302.
5. To study a crime case in which an accused was punished on charge of rape under Section 375.
6. To cite example of a case in which the opinion of an expert was called for under Section 45 of the Indian Evidence Act.

7. To cite a case wherein a person was detained under Article 22(5) of the Indian Constitution. Express your views whether the rights of the person as enlisted in this Article were taken care of.
8. To cite a case under Article 14 of the Constitution of India wherein the Right to Equality before Law was allegedly violated.
9. To list the restrictions imposed on Right to Freedom of Worship under the Constitution of India.
10. To prepare a schedule of persons convicted under Narcotics, Drugs and Psychotropic Act statistically analyze the age group to which they belonged.
11. To study a case in which Drugs and Cosmetic Act was invoked.
12. To study a case in which Explosive Substances Act was invoked.
13. To study a case in which Arms Act was invoked.
14. In light of Section 304B of the Indian Penal Code, cite a case involving dowry death.
15. To study a case wherein the Untouchability Offences Act was invoked on the basis of Article 15 of the Constitution of India.

SECOND SEMESTER B. Voc. DEGREE PROGRAMME (Theory)

FORENSIC SCIENCE

FORENSIC CHEMISTRY & TOXICOLOGY

Code: SDC2FT05

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

a. The methods of analyzing trace amounts of petroleum products in crime scene evidence.
b. The methods of analyzing contaminants in petroleum products.
c. The classification and characteristics of the narcotics, drugs and psychotropic substances.
d. The significance of toxicological studies in forensic science.
e. The classification of poisons and their modes of actions.
f. The absorption of poisons in body fluids.
g. The forensic identification of illicit liquors.
h. The classification and characteristics of the narcotics, drugs and psychotropic substances.
i. The menace of designer drugs.
j. The methods of identifying and purifying narcotics, drugs and psychotropic substances.

Module I: 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.

Module II: Basics of Toxicology and Poisons

Significance of toxicological findings. Techniques used in toxicology. Toxicological analysisand chemical intoxication tests.Postmortem Toxicology.Human performance toxicology.Dose-response relationship. Lethal dose 50 and effective dose 50.Classification of poisons.Physico-chemical characteristics and mode of action of poisons.Accidental, suicidal and homicidal poisonings.Signs and symptoms of common poisoning and their antidotes.Collection and preservationof viscera, blood and urine for various poison cases.Identification of biocides and metal salts in body fluids.Metabolism and excretion ofpoisons.Application of immunoassays in forensic work.Animal poisons. Snake venom.Mode of action.Carbon monoxide poisoning.Vegetable poisons. Poisonous seeds, fruits, roots and mushrooms.Beverages.Alcoholic and non-alcoholic illicit liquors.Analysis and identification of ethylalcohol.Estimation of ethyl alcohol in blood and urine.Proof spirit.Crime scene management in illicit liquor cases.

Module III: Narcotics, Drugs, Psychotropic Substances and Alcoholic Beverages

Definition of narcotics, drugs and psychotropic substances.Broad classification – Narcotics, stimulants, depressants and hallucinogens.General characteristics and common example of each classification.Natural, synthetic and semi-synthetic narcotics, drugs and psychotropic substances.Designer drugs.Tolerance, addiction and withdrawal symptoms of narcotics, drugs and psychotropic substances**.**Crime scene search for narcotics, drugs and psychotropic substances – searching a suspect, searching a dwelling, searching a vehicle.Clandestine drug laboratories.Collection and preservation of drug evidence.Testing of narcotics, drugs and psychotropic substances.Isolation techniques for purifying narcotics, drugs and psychotropic substances – thin layer chromatography, gas-liquid chromatography and high performance liquid chromatography.Presumptive and screening tests for narcotics, drugs and psychotropic substances.Microcrystalline testing of drugs of abuse.Analysis of narcotics, drugs and psychotropic substances in breast milk, saliva, urine, hair and antemortemblood.Drugs and

driving. Dope tests. Analysis of narcotics, drugs and psychotropic substances in postmortem blood. Postmortem changes affecting the analysis of narcotics, drugs and psychotropic substances.

Recommended Reading:

1. A.A. Moenssens, J. Starrs, C.E. Henderson and F.E. Inbau, *Scientific Evidence in Civil and Criminal Cases*, 4th Edition, The Foundation Press, Inc., New York (1995).
2. R. Saferstein, *Criminalistics*, 8th Edition, Prentice Hall, New Jersey (2004).
3. W.J. Tilstone, M.L. Hastrup and C. Hald, Fisher's, *Techniques of Crime Scene Investigation*, CRC Press, Boca Raton (2013).
4. F.G. Hofmann, *A Handbook on Drug and Alcohol Abuse*, 2nd Edition, Oxford University Press, New York (1983).
5. S.B. Karch, *The Pathology of Drug Abuse*, CRC Press, Boca Raton (1996).
6. A. Poklis, Forensic toxicology in, *Introduction to Forensic Sciences*, 2nd Edition, W.G. Eckert (Ed.), CRC Press, Boca Raton (1997).
7. A.W. Jones, Enforcement of drink-driving laws by use of per se legal alcohol limits: Blood and/or breath concentration as evidence of impairment, *Alcohol, Drug and Driving*, 4, 99 (1988).

FORENSIC CHEMISTRY & TOXICOLOGY(PRACTICAL)

Code:SDC2FT07(P)

1. To carry out analysis of gasoline.
2. To carry out analysis of diesel.
3. To carry out analysis of kerosene oil.
4. To identify illicit drugs by spot tests.
5. To perform color tests for opiates.
6. To perform color tests for barbiturates.
7. To identify methyl alcohol.
8. To identify ethyl alcohol.
9. To identify biocides.
10. To identify metallic poisons.
11. To identify organic poisons.
12. To identify ethyl alcohol.
13. To identify methyl alcohol.
14. To carry out quantitative estimation of ethyl alcohol.
15. To prepare iodoform.
16. To identify drugs of abuse by spot tests.
17. To perform colour tests for barbiturates.
18. To separate drugs of abuse by thin layer chromatography.

SECOND SEMESTER B. Voc. DEGREE PROGRAMME (Theory)

FORENSIC SCIENCE

INSTRUMENTATION TECHNIQUES

Code: SDC2IT06

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

a. *The importance of chromatographic and spectroscopic techniques in processing crime scene evidence.*
b. *The utility of colorimetry, electrophoresis and neutron activation analysis in identifying chemical and biological materials.*
c. *The significance of microscopy in visualizing trace evidence and comparing it with control samples.*
d. *The usefulness of photography and videography for recording the crime scenes.*

Module I:Instrumentation

Sample preparation for chromatographic and spectroscopic evidence.Chromatographic methods.Fundamental principles and forensic applications of thin layer chromatography, gas chromatography and liquid chromatography.Spectroscopic methods.Fundamental principles and forensic applications of Ultraviolet-visible spectroscopy, infrared spectroscopy, atomic absorption spectroscopy, atomic emission spectroscopy and mass spectroscopy. X-ray spectrometry. Colorimetric analysis and Lambert-Beer law.Electrophoresis – fundamental principles and forensic applications.Neutron activation analysis – fundamental principles and forensic applications.

Module II:Microscopy and Forensic photography

Fundamental principles.Magnification, Resolution, Different types of microscopes-Compound microscope, Comparison microscope, Electron microscope.SEM, TEM, Stereomicroscope Polarization and application Forensic applications of microscopy.Basic principles and applications of photography in forensic science.3D photography.Photographic evidence.Infrared and ultraviolet photography.Digital photography.Videography.Crime scene and laboratory photography.

Module III: Statistical methods

Measures of central tendency:- Mean, Median and Mode Measures of dispersion:- Range, Mean Deviation, Variance, Standard Deviation, Coefficient of variation. Correlation and regression (brief account). Probability:-Laws of probability. Addition theorem and Multiplication theorem. Probability Distribution:- Binomial Distribution, Normal Distribution and Poisson distribution Test of hypothesis:- Null hypothesis, Alternate hypothesis Chi-square test and t-test.

Recommended Reading:

1. D.A. Skoog, D.M. West and F.J. Holler, *Fundamentals of Analytical Chemistry,* 6th Edition, Saunders College Publishing, Fort Worth (1992).
2. W. Kemp, *Organic Spectroscopy*, 3rd Edition, Macmillan, Hampshire (1991).
3. J.W. Robinson, *Undergraduate Instrumental Analysis*, 5th Edition, Marcel Dekker, Inc., New York (1995).
4. D.R. Redsicker, *The Practical Methodology of Forensic Photography*, 2nd Edition, CRC Press, Boca Raton (2000).
5. Jasra. P.K. and Raj Gurdeep 2000. Biostatistics.
6. Khan, I.A. and Khayum. Fundamentals of Biostatistics. Wraaz Publ. Hyderabad.
7. Norman, T.J. Bailey. Statistical methods in Biology Cambridge Univ. Press.
8. Prasad, S. 2003. Elements of Biostatistics. Rastogi Publ.
9. Ramakrishnan, P. Biostatistics, Saras Publishers.

INSTRUMENTATION TECHNIQUES(PRACTICAL)

Code: SDC2IT08

1. To carry out thin layer chromatography of ink samples.
2. To determine the concentration of a colored compound by colorimetry analysis.
3. To carry out separation of organic compounds by paper chromatography.
4. To identify drug samples using UV-Visible spectroscopy.
5. To take photographs using different filters.
6. To take photographs of crime scene exhibits at different angles.
7. To record videography of a crime scene.
8. Work out the problems related to mean, median, mode, standard deviation, probability, Chi-square test, t-test and correlation.
9. Familiarise the technique of data representation (tables, bar-diagram, histogram, pie-diagram and frequency curve (manual and using computer).

THIRD SEMESTER B.Voc. DEGREE PROGRAMME (Theory)

FORENSIC SCIENCE

ARSON AND EXPLOSIVES

Code: GEC3AE08

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

a. *The method of searching, collecting, preserving and analyzing arson evidence.*
b. *The classification of explosives, including the synthesis and characterization of representative analogs.*
c. *The significance of bomb scene management.*
d. *The techniques of locating hidden explosives.*

Module I: 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.

Module II: Classification, Synthesis and characteristics of explosives

Low explosives and high explosives.Homemade explosives.Military explosives.Blasting agents.TNT, PETN and RDX.Explosion process. Blast waves.

Module III: Blast scene management

Searching the scene of explosion.Mechanism of explosion. Post blast residue collection and analysis. Blast injuries. Detection of hidden explosives.

Recommended Reading:

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).

THIRD SEMESTER B. Voc. DEGREE PROGRAMME (Theory)

FORENSIC SCIENCE

FORENSIC PHYSICS

Code: SDC3FP09

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

a. The art of collecting, packaging and preserving different types of physical and trace evidence at crime scenes.
b. The tools and techniques for analysis of different types of crime scene evidence.

Module I: Glass, Paint & Fibre

Collection, packaging, analysis of glass evidence.Matching of glass samples by mechanical fit and refractive index measurements.Analysis by spectroscopic methods. Fracture analysis and direction of impact. Paint evidence – collection, packaging and preservation. Analysis by destructive and non-destructive methods. Importance of paint evidence in hit and run cases. Fibre evidence – artificial and man-made fibres.Collection of fibre evidence.Identification and comparison of fibres.

Module II: Soil & Cloth evidence

Importance, location, collection and comparison of soil samples.Cloth evidence – importance, collection, analysis of adhering material.Matching of pieces.

Module III: Tool marks

Classification of toolmarks. Forensic importance of toolmarks. Collection, preservation and matching of toolmarks.Restoration of erased serial numbers and engraved marks.Forensicgemmology.Accident Analysis- Extent of vehicle damage, Estimation of speed, Tyre tread marks and skid marks, Trace evidence at accident sites, Hit and run investigations.

Recommended Reading:

1. E. Elaad in *Encyclopedia of Forensic Science, Volume 2*, J.A. Siegel, P.J. Saukko and G.C. Knupfer (Eds.), Academic Press, London (2000).
2. T.J. Gardener and T.M. Anderson, *Criminal Evidence*, 4th Ed., Wadsworth, Belmont (2001).
3. S.H. James and J.J. Nordby, *Forensic Science: An Introduction to Scientific and Investigative Techniques*, 2nd Edition, CRC Press, Boca Raton (2005).
4. W.J. Tilstone, M.L. Hastrup and C. Hald, Fisher's, *Techniques of Crime Scene Investigation*, CRC Press, Boca Raton (2013).

THIRD SEMESTER B. Voc. DEGREE PROGRAMME (Theory)

FORENSIC SCIENCE

FORENSIC BALLISTICS

Code: SDC3FB10

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

a. The classification of firearms and their firing mechanisms.
b. The methods of identifying firearms.
c. The characteristics of ammunition.
d. The importance of firearm evidence.
e. The nature of firearm injuries.
f. The methods for characterization of gunshot residue.

Module I:Firearms and ammunitions

Types of firearms and ammunition, Primer and priming compounds, Head stamp markings, Ballistics – internal, external and terminal. Mechanism of gun.Various kinds of firing marks-rifling marks, base markings, chamber marking, extraction and Ejection markings. Comparison microscope-instrumentation.

Module II:Firearm evidence

Collection and preservation of firearm evidence- firearm, ammunition, targets etc,Identification of bullets, wads collected from scene of crime. Matching of bullets and cartridge cases, Gunshot residues-mechanism of formation, sample collection, analysis and instrumentation, Identification of shooter, Detection of range of firing- contact range, near contact, point blank, powder range, chip, Range, distant range, Determination of angle of impact, Ricochet analysis.

Module III: Identification and nature of firearm injuries

Identification and nature of firearm injuries, Shotgun, pistol, revolver, rifle, air guns.Bullet hole examinations-entry and exit hole determination, Estimation of calibre from bullet holes, Wave and cavitation effect, Bullet and trajectory through glass and other targets, Reconstruction with respect to accident, suicide and homicide.

Recommended Reading:

1. B.J. Heard, *Handbook of Firearms and Ballistics*, Wiley and Sons, Chichester (1997).
2. W.F. Rowe, Firearms identification, *Forensic Science Handbook*, Vol. 2, R. Saferstein (Ed.), Prentice Hall, New Jersey (1988).
3. A.J. Schwoeble and D.L. Exline, *Current Methods in Forensic Gunshot Residue Analysis*, CRC Press, Boca Raton (2000).
4. E. Elaad in *Encyclopedia of Forensic Science, Volume 2*, J.A. Siegel, P.J. Saukko and G.C. Knupfer (Eds.), Academic Press, London (2000).
5. T.J. Gardener and T.M. Anderson, *Criminal Evidence*, 4th Ed., Wadsworth, Belmont (2001).
6. S.H. James and J.J. Nordby, *Forensic Science: An Introduction to Scientific and Investigative Techniques*, 2nd Edition, CRC Press, Boca Raton (2005).
7. W.J. Tilstone, M.L. Hastrup and C. Hald, Fisher's, *Techniques of Crime Scene Investigation*, CRC Press, Boca Raton (2013).

FORENSIC PHYSICS & BALLISTICS(PRACTICAL)

Code: SDC3FP11(P)

1. To compare soil samples by density gradient method.
2. To compare paint samples by physical matching method.
3. To compare paint samples by thin layer chromatography method.
4. To compare glass samples by refractive index method.
5. To identify and compare tool marks.
6. To compare cloth samples by physical matching.
7. To describe, with the aid of diagrams, the firing mechanisms of different types of firearms.
8. To correlate the velocity of bullet with the impact it produces on the target.
9. To correlate the striking angle of the bullet with the impact on the target.
10. To estimate the range of fired bullets.
11. To carry out the comparison of fired bullets.
12. To carry out the comparison of fired cartridge cases.
13. To identify gunshot residue.
14. To correlate the nature of injuries with distance from which the bullet was fired.
15. To differentiate, with the aid of diagram, contact wounds, close range wounds and distant wounds.

FOURTH SEMESTER B.Voc. DEGREE PROGRAMME (Theory)

FORENSIC SCIENCE

FORENSIC AUDIO VIDEO ANALYSIS

Code: GEC4AV11

Module I: Introduction of Sound

The generation of sound**,**Speech anatomy and mechanism,Physical properties of vibrating systems**,** Phonemes.Articulation.Phonetic aspects of speech, principles of speaker recognition.

Module II: Audio evidences

Collection and specimen sample collection. Speaker recognition – manual, semi – automatic and automatic methods and familiarization of some software.Fourier analysis, Fourier transforms, acoustic speech production, error in speaker identification, application in automatic speaker identification and verification system.

Module III: Video evidences

The generation of video, the concepts of editing, Image clarification in a video – methods and familiarization of software.Forensic audio video analysis, voltage, decibels, audio line levels, frequency measurements, spectrum analysis, noise characteristics, digital filters and audio enhancement, authentication off-recorded audio, speech spectrographic analysis, magnetic developing and optical methods. Falsification in video recording, video frame sequence, method – waveform – vectroscope, videogrametry and photogrametry techniques, video image analysis, facial image recognition from video frame image

Recommended Reading:

1. Arthur R Weeks Jr; *Fundamentals of Electronic Image*. SPIE Press, (2003).
2. Bengold& Nelson Moryson; *Speech and Audio signal processing*, John Wiley &Sons, USA (1999).
3. D.B. Fry; *The Physics of Speech*, Cambridge University Press. (2004).
4. David Cheshire; *The Complete Book of Video Techniques Subjects Equipment*, Dorling Kindersley, London (1992).
5. Gloria J. Borden *et al.Speech Science Primer (Physiology, Acoustics and perception of Speech)*, 6th Ed, a Wolters Kluwer Company, USA. (2011)
6. Harry Hollien; *Forensic Voice Identification*, Academic Press, London. (2001).
7. John C. Russ; *Forensic Uses of Digital Imaging* CRC Press, (2001).
8. Taylor and Francis, *Forensic Science Series*, London (2002)

FOURTH SEMESTER B. Voc. DEGREE PROGRAMME (Theory)

FORENSIC SCIENCE

FORENSIC DERMATOGLYPHICS AND QUESTIONED DOCUMENTS

Code: SDC4FQ13

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

a. The fundamental principles on which the science of fingerprinting is based.
b. Fingerprints are the most infallible means of identification.
c. The world's first fingerprint bureau was established in India.
d. The method of classifying criminal record by fingerprints was worked out in India, and by Indians.
e. The physical and chemical techniques of developing fingerprints on crime scene evidence.
f. The significance of foot, palm, ear and lip prints.
g. The importance of examining questioned documents in crime cases.
h. The tools required for examination of questioned documents.
i. The significance of comparing hand writing samples.
j. The importance of detecting frauds and forgeries by analyzing questioned documents.

Module I: Basics of Fingerprinting

Introduction and history, with special reference to India.Biological basis of fingerprints.Formation of ridges.Fundamental principles of fingerprinting.Types of fingerprints. Fingerprint patterns. Fingerprint characters/minutiae. Plain and rolled fingerprints.Classification and cataloguing of fingerprint record. Automated Fingerprint Identification System.Significance of poroscopy and edgeoscopy.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.Application of light sources in fingerprint detection.Preservation of developed fingerprints.Digital imaging for fingerprint enhancement.Fingerprinting the deceased. Developing fingerprints on gloves.

Module II: Other Impressions

Importance of footprints. Casting of foot prints, Electrostatic lifting of latent foot prints. Palm prints.Lip prints - Nature, location, collection and examination of lip prints. Ear prints and their significance.Palm prints and their historical importance.

Module III: Nature and Scope of Questioned Documents

Definition of questioned documents.Types of questioned documents.Preliminary examination of documents.Basic tools needed for forensic documents' examination – ultraviolet, visible, infrared and fluorescence spectroscopy, photomicrography, microphotography, visible spectral comparator, electrostatic detection apparatus.Determining the age and relative age of documents.Comparison of Documents- Comparison of handwriting.Development of individuality in handwriting.Natural variations and fundamental divergences in handwritings.Class and individual characteristics.Merits and demerits of exemplar and non-exemplar samples during comparison of handwriting.Standards for comparison of handwriting.Comparison of paper, ink, printed documents, typed documents, Xeroxed documents.Forgeries- Alterations in documents, including erasures, additions, over-writings and obliterations. Indented and invisible writings.Charred documents.Examination of counterfeit Indian currency notes, passports, visas and stamp papers. Disguised writing and anonymous letters.

Recommended 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 an M. Stoilovic, *Fingerprints and other Ridge Skin Impressions*, CRC Press, Boca Raton (2004).
4. Lee and Gaensleen's, *Advances in Fingerprint Technology*, 3rd Edition, R.S. Ramotowski (Ed.), CRC Press, Boca Raton (2013).
5. O. Hilton, *Scientific Examination of Questioned Documents*, CRC Press, Boca Raton (1982).
6. A.A. Moenssens, J. Starrs, C.E. Henderson and F.E. Inbau, *Scientific Evidence in Civil and Criminal Cases*, 4th Edition, Foundation Press, New York (1995).
7. R.N. Morris, *Forensic Handwriting Identification: Fundamental Concepts and Principles*, Academic Press, London (2000).
8. E. David, *The Scientific Examination of Documents – Methods and Techniques*, 2nd Edition, Taylor & Francis, Hants (1997).

FORENSIC DERMATOGLYPHICS AND QUESTIONED DOCUMENTS(PRACTICAL)

Code: SDC4FQ15 (P)

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.
6. To investigate physical methods of fingerprint detection.
7. To investigate chemical methods of fingerprint detection.
8. To use different light sources for enhancing developed fingerprints.
9. To prepare cast of foot prints.
10. To identify handwriting characters.
11. To study natural variations in handwriting.
12. To compare handwriting samples.
13. To detect simulated forgery.
14. To detect traced forgery.
15. To study the line quality defects in handwriting samples.
16. To examine the security features of currency notes, passports and plastic money.
17. To study alterations, obliterations and erasures in handwriting samples.

FOURTH SEMESTER B. Voc. DEGREE PROGRAMME (Theory)

FORENSIC SCIENCE

CRIMINOLOGY, PENOLOGY, VICTIMOLOGY & FORENSIC PSYCHOLOGY

CODE: SDC4CPV14

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

a. The importance of criminology, penology and victimology.
b. The causes of criminal behavior.
c. The significance of criminal profiling to mitigate crime.
d. The consequences of crime in society.
e. The critical assessment of advanced forensic techniques like polygraphy, narcoanalysis and brain electrical oscillation signatures.

Module I: Basics of Criminology, Penology, Victimology

Definition, aims and scope. Theories of criminal behaviour – classical, positivist, sociological.Criminal anthropology.Understanding modus operandi.Investigative strategy.Role of media.Crime- Elements, nature, causes and consequences of crime. Deviant behaviour. Hate crimes, organized crimes and public disorder, domestic violence and workplace violence.White collar crimes, Victimology.Juvenile delinquency.Social change and crime.Psychological Disorders and Criminality.Situational crime prevention. Penology- Meaning, Definition and Scope, Meaning and Importance of Punishment, Punishment in ancient

and modern times, History of correctional administration, Different prisons, Prison Acts, Theories of punishment.Treatment- Institutional, Non-institutional.

Module II:Psychology and criminal behavior

Crime-biological factors, Biological perspective – nervous system:- central nervous system, structure and functions ofCNS, peripheral nervous system. Endocrine system:- pituitary gland, thyroid gland, neurotransmitters. socio learning theories, psycho-social factors, Theories of offending- social cognition, moral reasoning, Psychopathology and personality disorders, Psychological assessment, Ethical issues of forensic psychology.

Module III:Basics of Forensic Psychology

Definition and fundamental concepts of forensic psychology and forensic psychiatry, Psychological evidence, Eyewitness testimony, Confession evidence, Criminal profiling, Psychology in the courtroom with special reference to section 84IPC.Tools for detection of deception- interviews, nonverbal detection, statement analysis, voice. Stress analysis, hypnosis, case study methods. Polygraphy- operational and question formulation techniques, ethical and legal aspects**.** Narco analysis and brain mapping – principle and theory, ethical and legal issues.

Recommended Reading:

1. S.H. James and J.J. Nordby, *Forensic Science: An Introduction to Scientific and Investigative Techniques*, 2nd Edition, CRC Press, Boca Raton (2005).
2. D.E. Zulawski and D.E. Wicklander, *Practical Aspects of Interview and Interrogation*, CRC Press, Boca Raton (2002).
3. R. Saferstein, *Criminalistics*, 8th Edition, Prentice Hall, New Jersey (2004).
4. J.L. Jackson and E. Barkley, *Offender Profiling: Theory, Research and Practice*, Wiley, Chichester (1997).
5. R. Gupta, *Sexual Harassment at Workplace,* LexisNexis, Gurgaon (2014).

CRIMINOLOGY, PENOLOGY, VICTIMOLOGY & FORENSIC PSYCHOLOGY (PRACTICAL)

Code: SDC4CPV16 (P)

1. To review past criminal cases and elucidate which theory best explains the criminal behavior of the accused.
2. To review crime cases where criminal profiling assisted the police to apprehend the accused.
3. To cite examples of crime cases in which the media acted as a pressure group.
4. To evaluate the post-trauma stress amongst victims of racial discrimination.
5. To correlate deviant behavior of the accused with criminality (take a specific example).
6. To evaluate victimology in a heinous crime.
7. To examine a case of juvenile delinquency and suggest remedial measures.
8. To evaluate how rising standards of living affect crime rate.
9. To review the recommendations on modernization of police stations and evaluate how far these have been carried out in different police stations.
10. To visit a 'Model Police Station' and examine the amenities vis-à-vis conventional police stations.
11. To examine steps being taken for rehabilitation of former convicts and suggests improvements.
12. To prepare a report on interrogation cells and suggest improvements.

FIFTH SEMESTER B.Voc. DEGREE PROGRAMME (Theory)

FORENSIC SCIENCE

FORENSIC MEDICINE

Code: GEC5FM13

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

a. The duties of the first responding officer who receives a call on homicide or suicide case.
b. The steps involved in processing the death scene.
c. The importance of ascertaining whether the crime was staged to appear as suicide or accident.
d. The importance of bloodstain patterns in reconstructing the crime scene.
e. The importance of autopsy.
f. The importance of forensic odontology.

Module I: Death Investigations

Fundamental aspects and scope of forensic medicine.Approaching the crime scene of death.Obtaining first hand information from the caller.Rendering medical assistance to the victim, if alive.Protecting life.Recording dying declaration.Identifying witnesses and, if possible, suspect. Interviewing onlookers and segregating possible witnesses.Suspect in custody – initialinterrogation and searching for evidence. Miranda warning card.Assessing the crime scene.Request for forensic team.Importance of command post and log book.Management of crowd and media.Importance of taking notes.Items to be a part of noting.Documenting the death scene.Processing evidence.Evaluation of injuries.Indexing the death investigation.Handling buried body cases – search for buried bodies, methods of exhumation.Suicide cases – evaluating the type of injuries, gauging the psychological state of victim, suicide notes.

Module II: Autopsy

Forensic pathology.Medico-legal aspects of death.Causes of death.Determination of time since death.Investigation of sexual offences.Death by drowning.Injuries.Types and classification of injuries.Antemortem and post mortem injuries.Aging of injuries.Artificial injuries.

Unit III: Forensic Odontology

Development, scope and role of forensic odontology in mass disaster and anthropology.Types of teeth and their comparative anatomy.Bite marks. Forensic significance of bite marks. Collection, preservation and photography of bite marks evidence. Legal aspects of bite marks.Estimation of age from teeth.

Recommended Reading:

1. K. Smyth, *The Cause of Death*, Van Nostrand and Company, New York (1982).
2. M. Bernstein, Forensic odontology in, *Introduction to Forensic Sciences*, 2nd Ed., W.G. Eckert (Ed.), CRC Press, Boca Raton (1997).
3. J. Dix, *Handbook for Death Scene Investigations*, CRC Press, Boca Raton (1999).
4. H.B. Baldwin and C.P. May in, *Encyclopedia in Forensic Science*, *Volume 1*, J.A. Siegel, P.J. Saukko and G.C. Knupfer (Eds.), Academic Press, London (2000).
5. V.J. Geberth, *Practical Homicide Investigation*, CRC Press, Boca Raton (2006).
6. T. Bevel and R.M. Gardner, *Bloodstain Pattern Analysis*, 3rd Edition, CRC Press, Boca Raton (2008).
7. W.J. Tilstone, M.L. Hastrup and C. Hald, Fisher's, *Techniques of Crime Scene Investigation*, CRC Press, Boca Raton (2013).

FIFTH SEMESTER B.Voc. DEGREE PROGRAMME (Theory)

FORENSIC SCIENCE

FORENSIC BIOLOGY AND SEROLOGY

Code: GEC5FBS14

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

a. The significance of biological and serological evidence.
b. The forensic importance of hair evidence.
c. The importance of biological fluids – blood, urine, semen, saliva, sweat and milk – in crime investigations.
d. How forensic entomology assists in death investigations.
e. The usefulness of genetic markers in forensic investigations.
f. The forensic importance of bloodstain patterns

Module I: Biological evidence

Hair- Significance, transfer and recovery, Structure of human hair, Morphology and biochemistry of human hair, Comparison of hair samples, Comparison of human and animal hairs. Semen- Forensic significance of semen, Composition and morphology of spermatozoa, Collection, evaluation and tests for identification of semen.Types and identification of microbial organisms of forensic significance, Diatoms and their forensic significance, Structure and analysis of skull and bones.

Module II: Serological evidence

Composition of blood, Collection and preservation of blood evidence, Importance of dried blood stains, Antigens and antibodies, ABO blood groups, Determination of blood group from dried blood stains, Extracellular proteins and intracellular enzymes, Blood spatter analysis – basics, Composition and analysis of common body fluids like saliva, milk, sweat, urine, etc.

Module III:Forensic entomology

Insects of forensic importance, Collection of entomological evidence during death investigations.General Entomology- significance of terrestrial and aquatic insects in forensic investigations and their role in crime detection, Insect's succession and its relationship to determine time since death.Impact of ecological factors on insect's developments.

Recommended Reading:

1. L. Stryer, *Biochemistry*, 3rd Edition, W.H. Freeman and Company, New York (1988).
2. R.K. Murray, D.K. Granner, P.A. Mayes and V.W. Rodwell, *Harper's Biochemistry*, APPLETON & Lange, Norwalk (1993).
3. S. Chowdhuri, *Forensic Biology*, BPRD, New Delhi (1971).
4. R. Saferstein, *Forensic Science Handbook*, Vol. III, Prentice Hall, New Jersey (1993).
5. G.T. Duncan and M.I. Tracey, Serology and DNA typing in, *Introduction to Forensic Sciences*, 2nd Edition, W.G. Eckert (Ed.), CRC Press, Boca Raton (1997).

FIFTH SEMESTER B. Voc. DEGREE PROGRAMME (Theory)

FORENSIC SCIENCE

ADVANCED TECHNIQUES IN PERSONAL IDENTIFICATION

Code: SDC5AP17

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

a. The basic principle of DNA analysis.

b. *The forensic significance of DNA typing.*
c. *The importance of short tandem repeats and restriction fragment length polymorphism in DNA technique.*
d. *Role of DNA typing in parentage testing.*
e. *Importance of forensic anthropology in identification of persons.*
f. *Different techniques of facial reconstruction and their forensic importance.*
g. *Significance of somatoscopy and somatometry.*
h. *The basis of biometry.*
i. *The classification of biometric processes.*
j. *The importance of behavioral biometry.*

Module I: Forensic DNA analysis

DNA – fundamentals, structure, composition, Mitochondrial DNA, Evidentiary clue materials-collection of specimens, Extraction of sample for analysis, Polymerase Chain Reaction (PCR), Short Tandem Repeats (STR)- Role of fluorescent dyes, Restriction Fragment Length Polymorphism(RFLP), Touch DNA. Individuality determination – maternity and paternity issues.Role of DNA typing in identifying unrecognizable bodies.Allele frequency determination.Hardy-Weinberg law.Probability determination in a population database.

Module II: Forensic Anthropology

Scope of forensic anthropology.Somatoscopy- observation of forehead, eye, nasal bridge, nasal tip, ear lobes, circumference of head, facial fractures etc. Somatometry- measurement of above features. Facial reconstruction- facial superimposition techniques and other techniques.

Module III: 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.Key biometric processes – enrolment, identification and verification.Positive and negative identification. Performance measures used in biometric systems – FAR, FRR, GAR, FTA, FTE and ATV. Biometric versus traditional

technologies.Physiological Biometrics- Fingerprints, palm prints, iris, retina, geometry of hand and face. Behavioral Biometrics- Handwriting, signatures, keystrokes, gait and voice.

Recommended Reading:

1. M.Y. Iscan and S.R. Loth, The scope of forensic anthropology in, *Introduction to Forensic Sciences*, 2nd Ed., W.G. Eckert (Ed.), CRC Press, Boca Raton (1997).
2. D. Ubelaker and H. Scammell, *Bones*, M. Evans & Co., New York (2000).
3. S.Rhine, *Bone Voyage: A Journey in Forensic Anthropology*, University of Mexico Press, Mexico (1998). J.M. Butler, *Forensic DNA Typing*, Elsevier, Burlington (2005).
4. K. Inman and N. Rudin, *An Introduction to Forensic DNA Analysis*, CRC Press, Boca Raton (1997).
5. H. Coleman and E. Swenson, *DNA in the Courtroom: A Trial Watcher's Guide*, GeneLex Corporation, Washington (1994).
6. W.J. Tilstone, M.L. Hastrup and C. Hald, Fisher's, *Techniques of Crime Scene Investigation*, CRC Press, Boca Raton (2013).
7. S. Nanavati, M. Thieme and R. Nanavati, *Biometrics*, Wiley India Pvt. Ltd. (2002).
8. P. Reid, *Biometrics for Network Security*, New Delhi (2004).
9. J.R. Vacca, *Biometric Technologies and Verification Systems*, Butterworth-Heinemann, Oxford (2007).

FIFTH SEMESTER B. Voc. DEGREE PROGRAMME (Theory)

FORENSIC SCIENCE

CRIME INVESTIGATION TECHNIQUES

Code: SDC5CT18

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

a. *The methods of securing, searching and documenting crime scenes.*
b. *The art of collecting, packaging and preserving different types of physical and trace evidence at crime scenes.*
c. *The legal importance of chain of custody.*
d. *The tools and techniques for analysis of different types of crime scene evidence.*
e. *To reconstruct crime scene.*

Module I: Crime Scene Management

Types of crime scenes – indoor and outdoor. Securing and isolating the crime scene.Crime scene search methods. Safety measures at crime scenes. Legal considerations at crime scenes.Documentation of crime scenes – photography, videography, sketching and recording notes.Duties of first responders at crime scenes.Coordination between police personnel and forensic scientists at crime scenes. The evaluation of 5Ws (who?, what?, when?, where?, why?) and 1H (how?). Crime scene logs.

Module II: Crime Scene Evidence and report writing

Classification of crime scene evidence – physical and trace evidence. Locard principle.Collection, labelling, sealing of evidence.Hazardous evidence.Preservation of evidence.Chain of custody.Report Writing and Evidence Evaluation- Components of reports and Report formants in respect of Crime Scene and Laboratory findings Court Testimony- admissibility of expert testimony, pre Court preparations & Court appearance, Examination in chief, cross examination and re-examination, Ethics in Forensic Science.

Module III: Crime Scene Reconstruction

Introduction, Importance of crime scene reconstruction, nature of reconstruction. Basic principle of reconstruction (Recognition, Identification, Individualization, Reconstruction), Stages of reconstruction, Types of reconstruction- Classification, Pattern evidence reconstruction, Writing a reconstruction report, general recommendations. Final report for court presentation, case study.

Recommended Reading:

1. M. Byrd, *Crime Scene Evidence: A Guide to the Recovery and Collection of Physical Evidence*, CRC Press, Boca Raton (2001).
2. T.J. Gardener and T.M. Anderson, *Criminal Evidence*, 4th Ed., Wadsworth, Belmont (2001).
3. S.H. James and J.J. Nordby, *Forensic Science: An Introduction to Scientific and Investigative Techniques*, 2nd Edition, CRC Press, Boca Raton (2005).

4. W.J. Tilstone, M.L. Hastrup and C. Hald, Fisher's, *Techniques of Crime Scene Investigation*, CRC Press, Boca Raton (2013).

ADVANCED TECHNIQUES IN PERSONAL IDENTIFICATION&CRIME INVESTIGATION TECHNIQUES(PRACTICAL)

Code: SDC5APCT20 (P)

1. To carry out extraction of DNA from body fluids.
2. To preparation of gel plates for electrophoresis.
3. To carry out electrophoresis for separation of enzymes.
4. To prepare a report on the role of DNA typing in solving paternity disputes.
5. To determine of age from skull and teeth.
6. To determine of sex from skull.
7. To determine sex from pelvis.
8. To study identification and description of bones and their measurements.
9. To investigate the differences between animal and human bones.
10. To perform somatometric measurements on living subjects.
11. To carry out craniometric measurements of human skull.
12. To estimate stature from long bone length.
13. To protect and record scene of crime by different methods of barricading (indoor and outdoor).
14. To photograph scene of crime: Bird eye view, angular photography and close-up photography, evidential photography with and without light source.
15. To videograph scene of crime: Full scene videography, evidential videography.
16. Sketching of crime scene: Rough sketch of indoor/ outdoor crime scene, Final sketch of indoor/ outdoor crime scene.
17. Searching of evidence on scene of crime: Evidence search using traditional method of searching, evidence searching using light sources and modern technology, search of evidence in case of old crime scenes.
18. To prepare a report on evaluation of crime scene.
19. Collection of evidence at scene of crime (Physical, chemical, biological, document, fingerprint, ballistics, etc.,)
20. Preservation of evidences according to their nature, stability, reactivity.
21. Packing, sealing and forwarding of physical evidence to forensic science laboratory.
22. To reconstruct a crime scene (outdoor and indoor).

FIFTH SEMESTER B. Voc. DEGREE PROGRAMME (Theory)

FORENSIC SCIENCE

CYBER CRIME & CYBER FORENSICS

Code: SDC5CC19

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

a. The basics of digital forensics.
b. The cases which fall under the purview of digital crimes.
c. The types of digital crimes.
d. The elements involved in investigation of digital crimes.

Module I: Computer fundamentals

Fundamentals of computer hardware and accessories, development of hard disk, physicalconstruction, CHS and LBA addressing, encoding methods and formats.Memory and processors – methods of storing data, Operating systems, Networks- LAN, WAN and MAN.

Module II: Cyber crimes

Definition and types of computer crimes.Distinction between computer crimes and conventional crimes.Reasons for commission of computer crimes.Breaching security and operation of digital systems.Computer virus, and computer worm – Trojan horse, trap door, super zapping, logic bombs. Types of computer crimes – computer stalking, pornography, hacking, crimes related to intellectual property rights, computer terrorism, hate speech, private and national security in cyber space.An overview of hacking, spamming, phishing and stalking.

Module III: Computer Forensic Investigations

Seizure of suspected computer. Preparation required prior to seizure.Collection and seizure of magnetic data, Treatment of exhibits, Extraction of information, Restoration of deleted files – familiarization of software, Encase, Cyber check suites, Encryption and decryption methods**.** Protocol to be taken at the scene.Extraction of information from the hard disk.Treatment of

exhibits.Creating bitstream of the original media.Collection and seizure ofmagnetic media.Legal and privacy issues.Examining forensically sterile media.Restorationof deleted files.Password cracking and E-mail tracking.Encryption and decryption methods.Tracking users.

Recommended Reading:

1. R.K. Tiwari, P.K. Sastry and K.V. Ravikumar, *Computer Crimes and Computer Forensics*, Select Publishers, New Delhi (2003).
2. C.B. Leshin, *Internet Investigations in Criminal Justice*, Prentice Hall, New Jersey (1997).
3. R. Saferstein, *Criminalistics*, 8th Edition, Prentice Hall, New Jersey (2004).
4. E. Casey, *Digital Evidence and Computer Crime*, Academic Press, London (2000).

CYBER CRIME & CYBER FORENSICS(PRACTICAL)

Code: SDC5CC21 (P)

1. To identify, seize and preserve digital evidence from crime scenes.
2. To detect deletions, obliterations and modifications of files using encase software.
3. To trace routes followed by e-mails and chats.
4. To identify the IP address of the sender of e-mails.
5. To demonstrate concealment techniques using cryptographic PGP.
6. To identify encrypted files.
7. To identify hidden files.
8. To use digital signatures for securing e-mail and online transactions.
9. To acquire data from PCs/laptops/HDDs/USBs, pen drives, memory cards and SIM cards.
10. To use symmetric and asymmetric keys for protection of digital record.
11. To carry out imaging of hard disks.

FIFTH SEMESTER B. Voc. DEGREE PROGRAMME (Theory)

FORENSIC SCIENCE

PROJECT WORK AND INTERNSHIP

Code: SDC6PJIT22

Students are required to undertake project work on problems pertaining to Forensic Science in VIth Semester. Project work should be done as an extension of topics in the syllabus. Scientific study on the topic selected is required to be carried out under the supervision and guidance of faculty members. Project work may be done as group of maximum of ten students. A part of the project may be done in collaboration (association) with any of the CFSL/FSL/RFSL/FPB/Chemical Examiner's Laboratory/ Kerala Police Academy/ Any other State or Central Institutions of Forensic importance. The hours spent for the project work in any of the above mentioned institutions shall be counted for the percentage of attendance, provided that the attendance certificate shall be produced from the institution. Each student has to actively participate in the project work. The problem/ topic chosen by an earlier batch of students for their project work shall not be repeated by a latter batch. A certificate to this effect has to be attached by the Head of the department. A well documented project report duly attested by the supervising teacher and the Head of the Department must be submitted by *each candidate* for evaluation separately on the day of practical examination during VIth semester. The project must contain the following sections.

1. Introduction and objectives of study (This part may contain citations of relevant literature in the field, if available).
2. Methodology.
3. Interpretation of results.
4. Reference

Institutional visits

During the course period, students are required to visit various institutions related with the forensic studies. A report of the institutional visits with the dated signature of the teacher concerned and duly certified by the Head of the Department shall be submitted at the time of practical examinations along with the practical record. No mark shall be awarded for the record without Institutional Visit Report.