Department of Forensic Science

Revised Syllabus of Diploma Courses (UG)

Preamble:

Forensic Science is the field which helps to law enforcement agencies to find the Criminal by applying Forensic Science Knowledge & Investigation Techniques. Most of the crime involves the Firearms evidences like revolver, gun powder, bullets etc. which needs to understand & examine them accordingly on the basis of to their types & manufacture. Forensic Ballistics is the area which provides detail knowledge about Firearms & its analysis techniques. This Syllabus help the students to get the in detail knowledge about Firearms & its importance related to Crime Scene Investigation in Forensic Science.

Program Objectives of the Course:

1. The student will able to understand the gross concept of Forensic Ballistics.
2. The students will able to understand firearms; how they are used, why they are used and why they are used frequently in the practice of murder.
3. Student will able to identify the weapons on the basis of their own unique identifying features.
4. The student will able to understand identify rifling patterns.
5. The student will able to understand the Forensic aspect of Ballistics, Firearms and ammunition and tools and techniques used in Forensic Ballistics.

Program Outcomes:

1. The students will able to understand the skills, abilities, and qualities of Forensic Ballistics and the various investigative tools and techniques used in Forensic Ballistics.
2. The students will able to understand history and developmental changes in Ballistics.
3. The students will able to understand the various type of firearms, ammunition.
3. The students will able to understand the aspect of wound ballistics.

Diploma Course (I Year)

1. Title: **Investigative Tools & Techniques in Forensic Ballistics**
2. Year of Implementation: **2020**
3. Duration: **One Year**
4. Pattern: **Annual**
5. Medium of Instruction: **English**
6. Contact hours: 7 hours/week for I Year
8. Structure of Course:

For UG

Year	Semester	Paper No.	Paper Code	Contact Hours	Credits (1Credid =12H)	Marks		
						Semester/ Annual Exam	Internal	Total
1	I	PT I	D *T 101	30	2.5	50	15	65
	II	PT II	D *T 202	30	2.5	50	10	60
		PL I	D* L101	120	5	100	25	125
		PP I	D *P101	30	2.5	50	-	50
		Total		**210**	**12.5**	**250**	**50**	**300**
2	III	PT III	D *T 301	30	2.5	50	15	65
	IV	PT IV	D *T 402	30	2.5	50	10	60
		PL II	D * L202	120	5	100	25	125
		PP II	D *P202	60	5	100	-	100
		Total		**240**	**15**	**300**	**50**	**350**
3	V	PT V	D* T 501	30	2.5	50	15	65
	VI	PT VI	D* T 502	30	2.5	50	10	60
		PL III	D* L 303	120	5	100	25	125
		PP III	D *P303	60	5	100	-	100
		Industrial/Incubation Training		10	1	-	-	-
		Total		**250**	**16**	**300**	**50**	**350**
Total				**700**	**43.2**	**850**	**150**	**1000**

Total No. of Papers: Theory: 6, Practical: 3, Project:3

Number of Lectures per week: 07

Theory: Semester, Practical and Project: Annual

PT: Paper Theory, PL: Paper Lab, PP: Paper Project, D: Diploma, * : Name of Subject, T : Theory, L: Lab, P: Project

D*T 101: PT I
(Contact Hrs: 30 Credits: 2.5)

Learning Objectives:

Students will be able to:

1. The students will able to understand the skills, abilities, and qualities of Forensic Ballistics and the various investigative tools and techniques used in Forensic Ballistics.
2. The students will able to understand history and developmental changes in Ballistics.

Unit I: Introduction to Forensic Ballistics (15)

Introduction to Forensic Ballistics, History and development of Forensic Ballistics, Key terms of - Internal, External and Terminal ballistics, Introduction, history and development of Firearms. Classification of firearms - (Early hand cannons, The matchlock, The wheel lock, The staphaunce, The flintlock, The percussion system, The pin fire system, The rim fire system The Dreyes needle, Fire rifle, The centre fire system, Needle fire system, Rifling, he revolver, Pistols, Bolt action rifle, Shotgun, Sub machine gun, Machine gun, zip guns (Improvised Firearms) etc.) Parts and function, Firearm safety, Assembly and disassembly of firearms. Introduction, history and development of Ammunition. Classification and components of Ammunition - Rim fire, centre fire, Case less, Blank ammunition, Tear gas, Grenade launcher, Dummy, Primers, Primer cap types, Berdan primer, Boxer primer, Cartridge cases - Rimless, semi rimmed, rimmed, belted, Bullet and its types, Shotgun ammunition- shotgun slugs, Head Stamps, Propellants.

Unit II: Field investigation and examination of Firearms and fired evidences (15)

Crime scene search, Identification, Recognition, Documentation, Collection, Marking, Preservation, and Transmission of fired evidences. Firearm Characteristics, Introduction, Manufacturing of barrel, Manufacturing of breech face, Marks on fired bullet, Marks found on fired shells, Types of firearm characteristics. (Class, Individual and Sub-class etc.) Technical Examination of Firearms and Fired Evidence, Introduction, Principle of Firearms identification, Problems in Firearms examination and identification, Test firing, Microscopic examination fired evidence, Gunshot residue analysis, and Restoration of Serial numbers. Tool mark Identification- Introduction, Tool marks, Residue from softer object on tool, types of tool marks, collection of tool marks, examination and comparison of tool marks. Detection of Gunshot Residues- Methods of analyzing gunshot residues Flameless atomic absorption spectrometry (FAAS) Scanning microscopy-energy dispersive X-ray Spectrometry (SEM-EDX) Tress metal detection technique (TMDT), Gunshot wounds through clothing, Analytical Examination of clothing for range determination The modified Greiss test, The sodium rhodizonate test, EDX for examination of clothes.

Learning Outcomes:

After completion of the unit, Student is able to:

1. Learn to conduct different methods of search for firearms and fired evidence as part of police investigation procedure.
2. Acquire the Knowledge of the appropriate procedures of processing a shooting incident crime scene.

3. Get the Knowledge of Manufacture of Firearms and its effect, Knowledge of firearm characteristics
4. Learn about different scientific equipments as aids of firearms and tool marks. Examination in his quest for successful investigation of cases involving firearms.
5. Learn & understand the proper procedure in examining firearms and fired evidence in a forensic laboratory.

D *T 102: PT II
(Contact Hrs: 30 Credits: 2.5)

Learning Objectives:

Students will be able to:

1. Understand the concept & terminologies related to Elementary Ballistics.
2. Understand & learn about Legal procedure of Firearm Examination & its Report Writing.

Unit I: Elementary Ballistics (15)

General- Energy considerations, Propellants, Initiation, Combustion of propellants, Density of loading, Atmospheric temperature, Shape of the cartridge case. Heat problems, Barrel pressure and its determination, Recoil, facts and measurement, Vibration and jump, Barrel fouling. External Ballistics- Trajectory formation, Vacuum trajectories, Range, Experimental determination and shape of trajectory, Spin, Drift, Angle of fire, Structure of the projectile, Sectional density, Influence of earth and escape velocity, Air resistance, Retardation, Wind deflection, Firing guns in the air, Ricochet. Gunshot Wounds - Contact wounds, Near-Contact wounds, Intermediate-Range wounds, Cylinder Gap, Muzzle Brakes/Compensators, Flash Suppressors, Gas Ports/Vents, Miscellaneous Powder Patterns, Distant Gunshot Wounds, Entrance Versus Exit wounds, Intermediary Targets, Stippling - Powder tattooing and Pseudo-Powder Tattooing, Pseudo-Soot Ricochet Bullets , Bone, Bullet wounds of the skull, Caliber determination from entrance wounds, Bullet Wipe, Backs patter.

Unit II: Report Writing & Legal Proceedings (15)

Report Writing & Preparation of a report, Purpose of writing an investigative report, Mechanics of good report Important principles i n reporting. Legal Proceedings Firearms and tool mark examiner as an expert witness, Guide questions in qualifying a firearms and tool marks expert witness. Laws on Firearms - Arms Act, 1959 and its Amendments.

Learning Outcomes:

After completion of the unit, Student is able to:

1. Learn related to several aspect of Elementary Ballistics.
2. Learn about the various terminologies used in External Ballistics.
3. Acquire the knowledge related to procedure of examining Shotgun ballistics.
4. Get the Knowledge of the various aspects of Gunshot wounds.

5. Learn the Skill in writing examination report to communicate the firearms and marks examiners findings.
6. Learn & acquire the knowledge with the possible questions that maybe asked on firearms and tool marks examiner the moment he appears in court as an expert witness.

Reference Books:

1. Fire arms in criminal investigation and trials By B R Sharma
2. Handbook of Fire arm and ballistics By Brian J Heard.
3. Fire Arms, Forensic Ballistics, Forensic Chemistry and Criminal Jurisprudence By S N Gaur et al.
4.Forensic Science in Criminal Investigation and Trials By B. R. Sharma.
5. Firearms and Forensic Ballistics By S. N. Gaur and B. C. Jauhari.
6. Arms Act (Bare Act)
7. Forensic Ballistics Guide for criminal lawyers, Police officers, Students, and Reviewers, By Zosmio A. Duyogan,2011.
8. Firearms Identification - Lesson For Criminology Students by Felipe Montojo,2006.
9. Forensic Ballistics by Erdulfo M.Grimares,2006.

D* L101: **(Practical):**
(Contact Hrs: 120 Credits: 05)

Learning Objectives:

Students will be able to:

1. Study & learn to Examine Fired Evidences.
2. Learn the skill of Collection & Packaging of Fired evidence.
3. Understand & learn to differentiate between Individual & Class Characteristics of Firearm.
4. Understand & Study Fire Arm Act.

List of Practical's (30)

1. To study Identification, Recognition of fired evidences.
2. To study Documentation, Collection, of fired evidences,
3. To study Marking, Preservation, Transmission of fired evidences.
4. Examination of Fire Arm according to Arms Act.
5. Dismantling and assembling of firearms-Revolver
6. Dismantling and assembling of firearms-Pistol
7. Dismantling and assembling of firearms-Rifle
8. To study the features of Rifled Guns.
9. To study the characteristics of Contact wounds.

10. To study the characteristics of Near-Contact wounds.
11. To study the characteristics of Intermediate-Range wounds.
12. Examination of Entrance Versus Exit wounds.
13. Examination of fired bullet and identification by comparing with standard data sheet.
14. Examination of firing pin marks on bullet.
15. Examination of cartridge case for chamber, ejector, and extractor marks.
16. Comparison of bullet, cartridge, pallets by ballistic comparison microscope.
17. Barrel wash test.
18. Determination of Trigger pulls of fire arm.
19. Identification of tool using standard data sheet
20. Dismantling and assembling of Shotguns.
21. Restoration of Serial numbers
22. To study Class characteristics of firearm.
23. To study Individual characteristics of firearm
24. To study Sub-class characteristics of firearm

Learning Outcomes:

Students will be able to:

1. To understand the skills, abilities, and qualities of Forensic Ballistics and the various investigative tools and techniques used in Forensic Ballistics.
2. To understand history and developmental changes in Ballistics.
3. To understand the various type of firearms, ammunition.
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9. Forensic Ballistics by Erdulfo M.Grimares,2006.

D *P101 (Project):
(Contact Hrs. 30, Credits: 2.5)