

## Sant Gadge Baba Amravati University, Amravati

## FACULTY : Science and Technology

**Scheme of Teaching, Learning, Examination & Evaluation leading to Two Years PG Degree Master of Science (Forensic Science) following Three Years UG Programme wef 2023-24  
(Two Years- Four Semesters Master's Degree Programme- NEPv23 with Exit and Entry Option****M.Sc. (Forensic Science) First Year Semester- I Level 6.0**

S. N.	Subject	Type of Course	Subject Code	Teaching & Learning Scheme							Duration Of Exam Hours	Examination & Evaluation Scheme								
				Teaching Period Per Week				Credits				Maximum Marks			Minimum Passing					
				L	T	P	Total	L/T	Practical	Total		Theory		Practical		Total Marks	Marks Internal	Marks External	Grade	
												Theory Internal	Theory +MCQ External	Internal	External					
0	*Pre-Requisite Course(s) if applicable/MOOC/Internship/FieldWork cumulatively If students wish to opt Minor Course ofUG as Major for PG, <b>balance 12 Credits</b> Course will have to be completed <b>(As and when applicable)</b>	Th-Prq		0	0	0	0	Additional Credits to be earned = (1) minus (2) (1). Credits from MajorDSC Courses in UG (minus) (2).The Credits already earned from the Course as Minor at UG, now to be opted as Major at PG			2	15	35			50	06	14	P	
1	Advancement in Fingerprints Analysis	Th-Major	FRS 100	4			4	4		4	3	30	70			100	12	28	P	
2	DSC-I.1 (Advanced Forensic Science)	Th-Major	FRS 101	4			4	4		4	3	30	70			100	12	28	P	
3	DSC-II.1 (Forensic Chemistry and Toxicology)	Th-Major	FRS 102	3			3	3		3	3	30	70			100	12	28	P	
4	DSC-III.1 (Forensic Physics and Ballistics)	Th-Major	FRS 103	3			3	3		3	3	30	70			100	12	28	P	
5	DSE-I /MOOC (Questioned Document/ Research & IPR/ Quality Management)	Th-Major Elective	FRS 104 (i/ii/iii)	4			4	4		4	3	30	70			100	12	28	P	
																	Minimum Passing Marks		Grade	
6	DSC-II.1 Lab (Forensic Science Practical I)	Pr-Major	FRS 105			4	4		2	2	4			50	50	100	50		P	
7	DSC-III.1 Lab (Forensic Science Practical II)	Pr-Major	FRS 106			4	4		2	2	4			50	50	100	50		P	
8	# On Job Training, Internship/ Apprenticeship; Field projects Related to Major @ during vacations cumulatively	Related to DSC		120 Hours cumulatively during vacations of Semester I and Semester II							4*									P*
9	Co-curricular Courses: Health and wellness, Yoga Education, Sports and Fitness, Cultural Activities, NSS/NCC,Fine/Applied/Visual/Performing Arts During Semester I, II, III and IV	Generic Optional		90 Hours Cumulatively From Sem I to Sem IV																
	<b>TOTAL</b>									22						700				

L: Lecture, T: Tutorial, P: Practical/Practicum

Pre-requisite Course mandatory if applicable: **Prq**, Theory : **Th**, Practical/Practicum: **Pr**, Faculty Specific Core: **FSC**, Discipline Specific Core: **DSC**, Discipline Specific Elective: **DSE**, Laboratory: **Lab**, **OJT**: On Job Training: Internship/ Apprenticeship; Field projects: **FP**; **RM**: Research Methodology; Research Project: **RP**, **Co-curricular Courses: CC**

**Note : #** On Job Training, Internship/ Apprenticeship; Field projects **Related to Major (During vacations of Semester I and Semester II) for duration of 120 hours mandatory to all the students, to be completed during vacations of Semester I and/or II. This will carry 4 Credits for learning of 120 hours. Its credits and grades will be reflected in Semester II credit grade report.**

Note: **Co-curricular Courses:** In addition to the above, CC also include but not limited to Academic activities like paper presentations in conferences, Aavishkar, start-ups, Hackathon, Quiz competitions, Article published, Participation in Summer school/ Winter School / Short term course, Scientific Surveys, Societal Surveys, Field Visits, Study tours, Industrial Visits, online/offline Courses on Yoga (Yoga for IQ development, Yoga for Ego development, Yoga for Anger Management, Yoga for Eyesight Improvement, Yoga for Physical Stamina, Yoga for Stress Management, etc.). These can be completed cumulatively during **Semester I, II, III and IV. Its credits and grades will be reflected in semester IV credit grade report.**



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## FACULTY : Science and Technology

Scheme of Teaching, Learning, Examination & Evaluation leading to Two Years PG Degree Master of Science (Forensic Science) following Three Years UG Programme wef 2023-24(Two Years- Four Semesters Master's Degree Programme- NEPv23 with Exit and Entry OptionM.Sc. (Forensic Science) First Year Semester- II | Level 6.0]

S. N.	Subject	Type of Course	Subject Code	Teaching & Learning Scheme							Duration Of Exam Hours	Examination & Evaluation Scheme								
				Teaching Period Per Week				Credits				Maximum Marks				Minimum Passing				
				L	T	P	Total	L/T	Practical	Total		Theory		Practical		Total Marks	Marks Internal	Marks External	Grade	
												Theory Internal	Theory +MCQ External	Internal	External					
1	DSC-I.2 (Forensic Engineering)	Th-Major	FRS 201	4			4	4		4	3	30	70			100	12	28	P	
2	DSC-II. (Communication and Report Writing)	Th-Major	FRS 202	3			3	3		3	3	30	70			100	12	28	P	
3	DSC-III.2.2 (Forensic & Correctional Psychology)	Th-Major	FRS 203	3			3	3		3	3	30	70			100	12	28	P	
4	DSE-II/MOOC (Forensic Biology/ Digital Forensics/ Cyber Security/)	Th-Major Elective	FRS 204 (i/ii/iii)	4			4	4		4	3	30	70			100	12	28	P	
																	Minimum Passing Marks			
5	DSC-I.2 Lab (Forensic Science Practical III)	Pr-Major	FRS 205			4	4		2	2	3			50	50	100	50		P	
6	DSC-II.2 Lab (Forensic Science Practical IV)	Pr-Major	FRS 206			4	4		2	2	3			50	50	100	50		P	
7	# On Job Training, Internship/ Apprenticeship; Field projects Related to Major @ during vacations cumulatively	Related to Major		120 Hours cumulatively during vacations of Semester I and Semester II						4*										P*
8	Co-curricular Courses: Health and wellness, Yoga Education, Sports and Fitness, Cultural Activities, NSS/NCC, Fine/Applied/Visual/Performing Arts, During Semester I, II, III and IV	Generic Optional		90 Hours Cumulatively From Sem I to Sem IV																
				Exit Option with a PG Diploma with 4 Credits On-the-job training/internship in the respective Major subject <ul style="list-style-type: none"> <li>Student has to earn Total minimum 4 Credits cumulatively during Vacations of Semester I and Semester II from internship in order to exit after First Year with PG Diploma (42-44 Credits) after Three Year UG Degree</li> </ul>																
	TOTAL									18+4* = 22						600				

L: Lecture, T: Tutorial, P: Practical/Practicum

Pre-requisite Course mandatory if applicable: Prq, Theory : Th, Practical/Practicum: Pr, Faculty Specific Core: FSC, Discipline Specific Core: DSC, Discipline Specific Elective: DSE, Laboratory: Lab, OJT: On Job Training; Internship/ Apprenticeship; Field projects: FP; RM: Research Methodology; Research Project: RP, Co-curricular Courses: CC

Note : # On Job Training, Internship/ Apprenticeship; Field projects Related to Major (During vacations of Semester I and Semester II) for duration of 120 hours mandatory to all the students, to be completed during vacations of Semester I and/or II.

**This will carry 4 Credits for learning of 120 hours. Its credits and grades will be reflected in Semester II credit grade report.**

Note: **Co-curricular Courses:** In addition to the above, CC also include but not limited to Academic activities like paper presentations in conferences, Aavishkar, start-ups, Hackathon, Quiz competitions, Article published, Participation in Summer school/ Winter School / Short term course, Scientific Surveys, Societal Surveys, Field Visits, Study tours, Industrial Visits, online/offline Courses on Yoga (Yoga for IQ development, Yoga for Ego development, Yoga for Anger Management, Yoga for Eyesight Improvement, Yoga for Physical Stamina, Yoga for Stress Management, etc.). These can be completed cumulatively during **Semester I, II, III and IV. Its credits and grades will be reflected in semester IV credit grade report.**



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**Scheme of Teaching, Learning, Examination & Evaluation leading to Two Years PG Degree Master of Science (Forensic Science) following Three Years UG Programme wef 2023-24****(Two Years- Four Semesters Master's Degree Programme- NEPv23 with Exit and Entry Option****M.Sc. (Forensic Science) Second Year Semester- III [Level 6.5]**

S. N.	Subject	Type of Course	Subject Code	Teaching & Learning Scheme							Duration Of Exam Hours	Examination & Evaluation Scheme								
				Teaching Period Per Week				Credits				Maximum Marks			Minimum Passing					
				L	T	P	Total	L/T	Practical	Total		Theory		Practical		Total Marks	Marks Internal	Marks External	Grade	
												Theory Internal	Theory+ MCQ External	Internal	External					
1	DSC-I.3 (Forensic Chemistry)	Th-Major	FRS 301	4			4	4		4	3	30	70			100	12	28	P	
2	DSC-II.3 (Forensic Drug Analysis)	Th-Major	FRS 302	4			4	4		4	3	30	70			100	12	28	P	
2	DSC-III.3 (Forensic Toxicology)	Th-Major	FRS 303	3			3	3		3	3	30	70			100	12	28	P	
3	DSE-III/MOOC (Instrumentation/ Quality Management/ Legal Aspects in Forensic Science I)	Th-Major Elective	FRS 304 (i/ii/iii)	3			3	3		3	3	30	70			100	12	28	P	
																	Minimum Passing Marks			
4	DSC-III.3 Lab (Lab 01)	Pr-Major	FRS 305			6	6		3	3	6			50	50	100	50		P	
5	DSE-Lab (Lab 02)		FRS 306			4	4		2	2	6			50	50	100	50			
6	Research Project Phase-I	Major			2	4	6	2	2	4	3			50	--	50	25		P	
7	Co-curricular Courses: Health and wellness, Yoga Education, Sports and Fitness, Cultural Activities, NSS/NCC, Fine/Applied/Visual/Performing Arts During Semester I, II, III and IV	Generic Optional		90 Hours Cumulatively From Sem I to Sem IV																
	<b>TOTAL</b>									<b>23</b>						<b>650</b>				

L: Lecture, T: Tutorial, P: Practical/Practicum

Pre-requisite Course mandatory if applicable: Prq, Theory : Th, Practical/Practicum: Pr, Faculty Specific Core: FSC, Discipline Specific Core: DSC, Discipline Specific Elective: DSE, Laboratory: Lab, OJT: On Job Training: Internship/ Apprenticeship; Field projects: FP; RM: Research Methodology; Research Project: RP, Co-curricular Courses: CC

Note: **Co-curricular Courses:** In addition to the above, CC also include but not limited to Academic activities like paper presentations in conferences, Aavishkar, start-ups, Hackathon, Quiz competitions, Article published, Participation in Summer school/ Winter School / Short term course, Scientific Surveys, Societal Surveys, Field Visits, Study tours, Industrial Visits, online/offline Courses on Yoga (Yoga for IQ development, Yoga for Ego development, Yoga for Anger Management, Yoga for Eyesight Improvement, Yoga for Physical Stamina, Yoga for Stress Management, etc.). These can be completed cumulatively during **Semester I, II, III and IV. Its credits and grades will be reflected in semester IV credit grade report.**

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S. N.	Subject	Type of Course	Subject Code	Teaching & Learning Scheme							Duration Of Exam Hours	Examination & Evaluation Scheme							
				Teaching Period Per Week				Credits				Maximum Marks			Minimum Passing				
												Theory		Practical		Total Marks			
				L	T	P	Total	L/T	Practical	Total		Theory Internal	Theory+ MCQ External	Internal	External		Marks Internal	Marks External	Grade
1	DSC-I.4 (Forensic Biology)	Th-Major	FRS 401	4			4	4		4	3	30	70		100	12	28	P	
2	DSC-II.4 (Forensic Serology)	Th-Major	FRS 402	4			4	4		4	3	30	70		100	12	28	P	
3	DSC- III.4 (Wildlife Forensics & Forensic Anthropology)	Th-Major	FRS 403	4			4	4		4	3	30	70		100	12	28	P	
4	DSE-IV /MOOC (DNA Fingerprinting/ Statistics/ / Legal Aspects in Forensic Science II)	Th-Major Elective	FRS 404 (i/ii/iii)	3			3	3		3	3	30	70		100	12	28	P	
																Minimum Passing Marks			
5	DSC- Laboratory (Lab 03)		FRS 405			2	2		2	2	3				100	50		P	
6	Research Project Phase-II	Major	FRS 406		2	8	10	2	4	6	3				150	75		P	
7	Co-curricular Courses: Health and wellness, Yoga Education, Sports and Fitness, Cultural Activities, NSS/NCC, Fine/Applied/Visual/Performing Arts During Semester I, II, III and IV	Generic Optional		90 Hours Cumulatively From Sem I to Sem IV															
	<b>TOTAL</b>									<b>23</b>					<b>650</b>				

**L: Lecture, T: Tutorial, P: Practical/Practicum**

Pre-requisite Course mandatory if applicable: **Prq**, Theory : **Th**, Practical/Practicum: **Pr**, Faculty Specific Core: **FSC**, Discipline Specific Core: **DSC**, Discipline Specific Elective: **DSE**, Laboratory: **Lab**, **OJT**: On Job Training: Internship/ Apprenticeship; Field projects: **FP**; **RM**: Research Methodology; Research Project: **RP**, **Co-curricular Courses: CC**

Note: **Co-curricular Courses**: In addition to the above, CC also include but not limited to Academic activities like paper presentations in conferences, Aavishkar, start-ups, Hackathon, Quiz competitions, Article published, Participation in Summer school/ Winter School / Short term course, Scientific Surveys, Societal Surveys, Field Visits, Study tours, Industrial Visits, online/offline Courses on Yoga (Yoga for IQ development, Yoga for Ego development, Yoga for Anger Management, Yoga for Eyesight Improvement, Yoga for Physical Stamina, Yoga for Stress Management, etc.). These can be completed cumulatively during **Semester I, II, III and IV. Its credits and grades will be reflected in semester IV credit grade report.**

**Table: Comprehensive Credits distribution amongst the type of Courses over Two Years (Four Semesters) PG Programme and Minimum Credits to be earned for PG Degree [M.Sc. (Forensic Science)]**

Sr. No.	Type of Course	Total Credits Offered	Minimum Credits Required
<b>1</b>	<b>MAJOR</b>		
	<b>i. DSC</b>	<b>56</b>	<b>56</b>
	<b>ii. DSE</b>	<b>16</b>	<b>16</b>
	<b>TOTAL</b>	<b>72</b>	<b>72</b>
<b>2</b>	<b>Advances in Fingerprints &amp; Questioned Documents (FSC/DSC: Major)</b>	<b>04</b>	<b>04</b>
<b>2</b>	<b>On Job Training, Internship/ Apprenticeship; Field projects Related to Major</b>	<b>04</b>	<b>04 for 120 Hours OJT/FP cum. (Minimum 60 Hours OJT/FP is mandatory)</b>
<b>3</b>	<b>Research Project</b>	<b>10</b>	<b>10</b>
	<b>OPTIONAL</b>		
<b>4</b>	<b>Co-Curricular Courses (offline and/or online as applicable):</b> Co-curricular Courses: Health and wellness, Yoga Education, Sports and Fitness, Cultural Activities, NSS/NCC, Fine/Applied/Visual/Performing Arts, CC also include but not limited to Academic activities like paper presentations in conferences, Aavishkar, start-ups, Hackathon, Quiz competitions, Article published, Participation in Summer school/ Winter School / Short term course, Scientific Surveys, Societal Surveys, Field Visits, Study tours, Industrial Visits, online/offline Courses on Yoga (Yoga for IQ development, Yoga for Ego development, Yoga for Anger Management, Yoga for Eyesight Improvement, Yoga for Physical Stamina, Yoga for Stress Management, etc.).		<b>Limited to Maximum 03 only (For 90 Hours of CC cumulatively)</b>
	<b>TOTAL</b>		<b>00</b>
	<b>TOTAL</b>	<b>93</b>	<b>88</b>

**Table A: Comprehensive Credit Distribution for CC**

S. N.	Activities (offline/online as applicable)	Credits at Levels						Letter Grade
		College	University	State	Zone if exist	National	International if exist	
1	Health and wellness, Yoga* Competitions *If a Course (online/offline) on Yoga is completed for 60 Hours, 2 credits will be awarded to the student (1 Credit = 30 Hours)	1	2	3	4	5	6	P (Pass)
2	Unnat Bharat Abhiyan [UBA]	1	2	3	4	5	6	P (Pass)
3	Sports and fitness activities (see separate <b>Table B</b> )	1	1 / 2	2 / 3	3 / 4	4 / 5	5 / 6	P (Pass)
4	Cultural activities, Fine/Applied/Visual/Performing Arts	1	2	3	4	5	6	P (Pass)
5	N.S.S. activities Camps	1	2	3	4	5	6	P (Pass)
6	Academic activities like Research Paper/Article/Poster presentations, Aavishkar, start-up, Hackathon, Quiz competitions, other curricular, co-curricular activities, students exchange programme etc.	1	2	3	4	5	6	P (Pass)
	Research Paper/Article published	--	1	2	-	4	6	P (Pass)
7	Participation in Summer school/ Winter School / Short term course	2 Credits						P (Pass)
	(not less than 30 hours 1 or 2 weeks duration)	4 Credits						P (Pass)
	(not less than 60 hours 2 or 3 weeks duration)	2 Credits						P (Pass)
	Scientific Surveys, Societal Surveys	1 Credit						P (Pass)
8	Field Visits, Study tours, Industrial Visits,	1 Credit						P (Pass)
	NCC Activities	As given in <b>Table C</b>						



**Table B: Credit Distribution for Sports and Fitness**

Sr. No.	Particulars of Sports Status ( Individual/ Team )	Credits	Letter Grade
1	College Level Participation	1	P (Pass)
2	University Level Participation	1	P (Pass)
3	University Level Rank 1, 2, 3	2	P (Pass)
4	State Level Participation	2	P (Pass)
5	State Level Rank 1, 2, 3	3	P (Pass)
6	Zonal Level Participation	3	P (Pass)
7	Zonal Level Rank 1, 2, 3	4	P (Pass)
8	National Level Participation	4	P (Pass)
9	National Level Rank 1, 2, 3	5	P (Pass)
10	International Level Participation	5	P (Pass)
11	International Level 1,2,3	6	P (Pass)

**Table C: Credit Distribution for NCC activities**

Sr. No.	Particulars of NCC Activities	Credits	Letter Grade
1	Participation in NCC activities	1	P (Pass)
2	'B' Certificate obtained	2	P (Pass)
3	'C' Certificate obtained	3	P (Pass)
4	State Level Participation	4	P (Pass)
5	National level Participation	5	P (Pass)
6	International Level Participation	6	P (Pass)

## Part A

### Faculty: Science and Technology

#### Programme: M. Sc. Forensic Science (NEPv23)

#### Programme Educational Objectives (PEOs)

- To mold the upcoming generation of youth which can apply the subject knowledge in their daily life
- To inculcate scientific attitude enriched with a legal perspective in the students
- To update the students with the needs of the judiciary and society.
- To develop a generation which feels responsible towards the society and the nation

#### Program Outcomes

At the time of graduation, students would be able to

**PO1. Critical Thinking:** Take informed actions after identifying the assumptions that frame our thinking and actions, checking out the degree to which these assumptions are accurate and valid, and looking at our ideas and decisions (intellectual, organizational, and personal) from different perspectives.

**PO2. Effective Communication:** Speak, read, write and listen clearly in person and through electronic media in English and in one Indian language, and make meaning of the world by connecting people, ideas, books, media and technology.

**PO3. Social Interaction:** Elicit views of others, mediate disagreements and help reach conclusions in group settings.

**PO4. Effective Citizenship:** Demonstrate empathetic social concern and equity centered national development, and the ability to act with an informed awareness of issues and participate in civic life through volunteering.

**PO5. Ethics:** Recognize different value systems including your own, understand the moral dimensions of your decisions, and accept responsibility for them.

**PO6. Environment and Sustainability:** Understand the issues of environmental contexts and sustainable development.

**PO7. Self-directed and Life-long Learning:** Acquire the ability to engage in independent and life-long learning in the broadest context socio-technological changes.

#### Program Specific Outcomes:

On completion of M.Sc. Forensic Science programme, graduates will be able to:

PSO-1: apply the knowledge of basic sciences for the purpose of justice

PSO-2: assess criminal behavior of a person

PSO-3: design and develop new investigation methods with scientific and legal applications

PSO-4: formulate novel analytical techniques in forensic sciences and test them

PSO-5: communicate effectively the principles and practice of forensic sciences

PSO-6: address issues of rate of crimes

PSO-7: follow professional ethics during investigation

### **Employability Potential of M. Sc. (Forensic Science):**

The scope of M. Sc. Forensic Science is very diverse when taking into consideration the various avenues that are available for students after graduation. The program M. Sc. (Forensic Science) offers the necessary knowledge, skills and attitude to nurture creativity. Some important skills and abilities honed by Forensic Science learners include:

- Curiosity to understand and solve crimes
- Attention to collect and analyse details
- Patience and determination towards the career
- Research and development skills
- Analytical skills
- Use of ICT enabled techniques
- Written and oral communications skills

Apart from the technical and specific skills, a Forensic Science graduate also acquires fundamental professional skills throughout the degree program to pursue careers not directly related to the field. These skills include:

- Presentation and interaction skills
- Evidence identification, collection, analysis and reporting skills
- Effective listening, reading and communication skills
- Modern ICT enabled skills
- Aptitude to work proficiently independently or in a team

Equipped with a bunch of requisite knowledge, skills and attitude, a degree in Forensic Science is recognized as a symbol of quality and commitment by employers within and outside the realm of chemical industries.

The thriving and widely recognized branches of Forensic Science like Fingerprints, Questioned Documents, Chemistry, Physics, Biology, Psychology, Digital and Cyber, etc. not only expand critical thinking and the ability to understand other application based scientific concepts more easily, but also open new horizons to pursue career in different fields.

- Forensic Science offers research and development of, modify and study crimes, scientific techniques to develop a proper investigation report having a specific purpose for wider use. They also accomplish various scientific studies to identify or find applications for protection of society. Many industries like pharmaceuticals, agriculture, paints, dyes, and many more prefer to employ forensic scientist.
- Inorganic Forensic Science has a greater potential in the fields of metallurgy, synthesis of new materials from different elements, bioinorganic, etc. It focusses on solving the fundamental problems associated with structure of atoms, molecules and their properties. Analytical chemists find their role for toxicology examinations, quality control and assessment, analysis of pharmaceuticals, investigations for forensic analysis, development of equipment, etc.
- Forensic scientists work for a particular private or government laboratory or organization, and also develop particular specialties like DNA Fingerprinting, toxicology, psychology to name a few.
- Forensic Science enhances critical ability and inculcates problem solving skills among the learners.

Apart from the core branches of Forensic Science, auxiliary branches like forensic engineering, fraud investigation, geo Forensic Science, etc., also offers a vast array of employability opportunities. Forensic Science graduates apply their skills within the areas of environmental sciences, medical fields, science communication, teaching or academic research, and a few to mention. Thus, a degree in Forensic Science widens numerous prospects and opportunities for a wide variety of careers in many different fields like science, research, business and health care, etc.

Some of the areas of work available to students after the M. Sc. Forensic Science course are blog writing, research centres, forensic science laboratories, law firms, academic institutions etc.

The scope of M. Sc. Forensic Science is available in both the public and the private sector, with both displaying demands for M. Sc. Forensic Science graduates. M. Sc. Forensic Science promises huge career scope to candidates. After completing the course, candidates can work as professionals in Insurance Companies, Forensic Science Laboratories, Research Centers, Medical Colleges, private clinics, police training centres, etc. and also opt for the teaching profession as a professor or a teacher

Mentioned below are some of the sectors which offers potential employability to M.Sc. Forensic Science graduates

- Academic Institutions
- Law Firms
- Research Centers
- Law Enforcement Training Schools
- Forensic Science Laboratory
- Consultancy Services
- Investigation Agency
- Journalism
- Judicial System

Some of the employability potentials for M.Sc. Forensic Science graduates are listed below: after completing M. Sc. Forensic Science,

- Students can do Ph.D. at IITs, NITs, IISERs, IISc, BARC, TIFR, CSIR, ICMR, AIIMS, NFSUs or other Universities and Colleges by clearing NET-JRF, GATE or PET examinations.
- Students can do Ph.D. from foreign Universities, students may get scholarships.
- Students can take teaching jobs at Universities or Sr. colleges by clearing NET, SET or UGC NET-JRF examinations.
- Research Scientists in various Public Sector Units like ONGC, IOCL, NTPC and Private sector industries.
- Students can become security analyst, penetration tester, software developers in IT industries.
- Students can become Quality Control Chemists/ Food Inspector at Food Co-operation of India, Food Safety and Standards etc.
- Student can become Investigator, Forensic Scientist, and Criminologist.
- Laboratory technicians to look after sophisticated instruments like NMR, Mass Spectrometer, UV-Visible Spectrophotometer, Single crystal machines, XRD, SEM, AAS, TEM, etc.
- Technician for repairing sophisticated instruments.
- Student can become medico legal officer, forensic pathologist.
- Research Scientist/ Operations Manager/ Chemists / Quality Manager / Research Manager at various industries like Pharmaceuticals, Cement, Plastic, Drugs, Paint, Dyes, Agricultural sector etc.
- Student can become Small or medium scale entrepreneur (own industry) for investigation purpose and for preventive forensic.
- Students can become Government officers by clearing UPSC, MPSC, Bank Probationary officers and other competitive examinations.
- Employee at Security Printing and Minting co-operation of India,
- Employee at Office in Indian Army, Navy and Air force.
- Forensic Science student work for police system (training) and also work as an investigator.
- Forensic Science students also work in central investigative agency like CBI, IB, NIA and for other force like BSF, NSG, BPRD, NCRB.
- Forensic Science student also work in journalism.
- Forensic science students work in judicial process.
- Free-lancer as educational you tube videos maker.
- Educational-aid maker.
- Free-lancer for creating awareness against Forensic Science.
- Students can work as come up with NGOs for superstition eradication.

### **Government jobs:**

There are a variety of career prospects waiting to be tapped at the government level. Because there is also a wide scope of research. Some of the government positions that can be considered are-

- Senior Research Associate
- Police officers
- Law enforcement officials
- Junior/Senior scientific assistants
- Forensic Investigator
- Forensic Accountant
- Forensic Computer Analyst
- Forensic assistant
- Digital and Cyber Forensic Expert
- Fraud investigator at insurance companies
- Assistant Chemical Analyzer
- Laboratory Technologist
- Research Analyst
- Research Officer
- Assistant Professor
- Quality Management Analyst

#### **Future Outlook and Scope:**

1. If the candidates do not wish to pursue job opportunities after M.Sc. Forensic Science, they can opt for higher education to polish their skills and gain a higher level of experience. They can go on to pursue PhD at premier institutes in India and abroad. They can appear for various competitive exams like NET/ GATE (in India) and JRE/ TOEFEL (Abroad) and avail fellowship for PhD. A significant amount of fellowship is available for pursuing PhD.
2. Candidates can acquire education in management and then can join industry or can start their own business or firm.

**Part B**

**Sant Gadge Baba Amravati University, Amravati**

Syllabus Prescribed for (Two Years- Four Semesters Master's Degree Programme- NEPv23

**Programme: MSc (Forensic Science) following Three Years UG Programme wef 2023-24**

Scheme for Teaching, Learning, Examination and Evaluation for

**M.Sc. Part-I (Forensic Science) Semester I**

Subject	Teaching hours per week	Credits	Theory Exam		Practical Exam		Total	Minimum Passing	
			Internal	External	Internal	External		Internal	External
<b>Faculty Specific Core</b>	04	04	30	70			100	12	28
<b>DSC □ I.1</b>	04	04	30	70			100	12	28
<b>DSC □ II.1</b>	03	03	30	70			100	12	28
<b>DSC □ III.1</b>	03	03	30	70			100	12	28
<b>DSE - I (i/ii/iii)</b>	04	04	30	70			100	12	28
<b>LAB – I</b>	04	02			50	50	100	25	
<b>LAB - II</b>	04	02			50	50	100	25	
<b>Total</b>	<b>28</b>	<b>22</b>					<b>700</b>		

Subject	Course Code	Course Title	Hrs/week	Credits
<b>Faculty Specific Core</b>	<b>FRS 100</b>	<b>Advancement in Fingerprints Analysis</b>	<b>4</b>	<b>4</b>
<b>DSC □ I.1</b>	<b>FRS 101</b>	<b>Advanced Forensic Science</b>	<b>4</b>	<b>4</b>
<b>DSC □ II.1</b>	<b>FRS 102</b>	<b>Forensic Chemistry and Toxicology</b>	<b>3</b>	<b>3</b>
<b>DSC □ III.1</b>	<b>FRS 103</b>	<b>Forensic Physics and Ballistics</b>	<b>3</b>	<b>3</b>
<b>DSE - I (i)</b>	<b>FRS 104 (i)</b>	<b>Questioned Document</b>	<b>4</b>	<b>4</b>
<b>DSE - I (ii)</b>	<b>FRS 104 (ii)</b>	<b>Research &amp; IPR</b>	<b>4</b>	<b>4</b>
<b>DSE - I (iii)</b>	<b>FRS 104 (iii)</b>	<b>Quality Management</b>	<b>4</b>	<b>4</b>
<b>Lab - I (based on DSC II.1)</b>	<b>FRS 105</b>	<b>Forensic Science Practical I</b>	<b>4</b>	<b>2</b>
<b>Lab - II (based on DSC III.1)</b>	<b>FRS 106</b>	<b>Forensic Science Practical II</b>	<b>4</b>	<b>2</b>

**M.Sc. Part-I (Forensic Science) Semester II**

Subject	Teaching hours per week	Credits	Theory Exam		Practical Exam		Total	Minimum Passing	
			Internal	External	Internal	External		Internal	External
<b>DSC □ I.2</b>	04	04	30	70			100	12	28
<b>DSC □ II.2</b>	03	03	30	70			100	12	28
<b>DSC □ III.2</b>	03	03	30	70			100	12	28
<b>DSE - II (i/ii/iii)</b>	04	04	30	70			100	12	28
<b>LAB - III</b>	04	02			50	50	100	25	
<b>LAB - IV</b>	04	02			50	50	100	25	
<b>Total</b>	<b>22</b>	<b>18</b>					<b>600</b>		

Subject	Course Code	Course Title	Hrs/week	Credits
<b>DSC □ I.2</b>	<b>FRS 201</b>	<b>Forensic engineering</b>	<b>4</b>	<b>4</b>
<b>DSC □ II.2</b>	<b>FRS 202</b>	<b>Communication &amp; Report Writing</b>	<b>3</b>	<b>3</b>
<b>DSC □ III.2</b>	<b>FRS 203</b>	<b>Forensic &amp; Correctional Psychology</b>	<b>3</b>	<b>3</b>
<b>DSE - II (i)</b>	<b>FRS 204 (i)</b>	<b>Forensic Biology</b>	<b>4</b>	<b>4</b>
<b>DSE - II (ii)</b>	<b>FRS 204 (ii)</b>	<b>Digital Forensics</b>	<b>4</b>	<b>4</b>
<b>DSE - I I(iii)</b>	<b>FRS 204 (iii)</b>	<b>Cyber Security</b>	<b>4</b>	<b>4</b>
<b>Lab - III (based on DSC II.2)</b>	<b>FRS 205</b>	<b>Forensic Science Lab III</b>	<b>4</b>	<b>2</b>
<b>Lab - IV (based on DSC III.2)</b>	<b>FRS 206</b>	<b>Forensic Science Lab IV</b>	<b>4</b>	<b>2</b>

**M.Sc. (Forensic Science) First Year Semester- I [ Level 6.0]**

<b>Code of the Course/ Subject</b>	<b>Title of the Course/Subject</b>	<b>(Total Number of Periods)</b>
<b>FRS 100</b>	<b>Advancement in Fingerprints Analysis (FSC)</b>	<b>60 hrs (4 hrs/week)</b>

**Course Outcomes:** At the end of the course, students will be able to

1. use various powders for fingerprint development.
2. develop fingerprints using various metal deposition methods.
3. enhance the fingerprints patterns after development
4. photograph the fingerprints clearly.
5. apply knowledge of emerging technology in fingerprint development.

**Syllabus:**

**Unit-I: Powder & Fuming Methods (10 hr)**

Traditional, Magnetic, Luminescent powder, Thermoplastic, Nanotechnology, Anti stroke; Powder suspension technique; Iodine Fuming Development Method, Cyanoacrylate fuming method; Chemical methods: Silver Nitrate & Reaction Mechanism, Ninhydrin-Chemistry and reaction Mechanism

**Unit-II: Metal Deposition I (10 hr)**

Silver nitrate, Physical developer- Chemistry and mechanism, Sequencing, reagent reliability test, bleach toning, potassium iodide toning, other toning process. Single Metal Deposition, Multi-metal deposition- I, II, III, IV

**Unit III: Metal Deposition II (10 hr)**

Fluorescent and vacuum metal deposition-reaction mechanism, conventional gold zinc process, sequencing. Lipid Reagent: Sudan black, chemistry and mechanism of Oil red O, Nile red, European chelate, etc.

**Unit IV: Chemical Method Development I (10 hr)**

Silver Nitrate & Reaction Mechanism: Silver Nitrate reagent, Mechanism of silver nitrate development of fingerprint, Procedure of development, silver, pre and post-treatment of silver nitrate. Chemistry & Reaction Mechanisms of Ninhydrin: Amino acid reagent, Ninhydrin-Chemistry and reaction Mechanism, Forensic application.

**Unit V: Chemical Method Development II (10 hr)**

Metal salt enhancement, Ninhydrin analogous, first analogous, aryl, alkyl and alkoxy analogous, 1, 8-Diazafluoren-9-one and 1, 2-Indanedione, miscellaneous amino acid reagent-p Dimethylaminocinamaldehyde, NBD chloride, Dansyl chloride, o-Phthalaldehyde, Fluorescamine, Genipin. Cyanoacrylate fuming, health and safety precautions, Pre-treatment and Post Treatment.

**Unit-V: Nanotechnology (10 hr)**



Introduction, Structure and properties of nanoparticles, Role of nanotechnology in Forensics, role of nanotechnology in fingerprint development, stability of nanoparticles in solution: Van der Waals interactions, electrostatic repulsion, Steric Hindrance, Optical properties, Types of nanoparticles, Visualizing Fingermarks using nanoparticles, Future Perspectives.

#### **Unit-VI: Enhancement Techniques for Fingerprints in Blood (10 hr)**

Introduction, Development of techniques for proof and enhancement of blood, Heme Techniques, Protein staining blood enhancement techniques, Powder suspension techniques, amino acid techniques, Spectrophotometric and spectrofluorimetric methods, Application of enhancement techniques, Aging of bloodstains, Sequencing of techniques to maximize enhancement and number of fingerprints.

#### **Course Material/Learning Resources**

1. Henry C. Lee & R. E. Ganesslen, Advances in Finger Print Technology, CRC Press, Boca Raton, London.
2. David R. Ashbaugh; Quantitative and Qualitative Friction Ridge Analysis, CRC Press
3. E. Roland Menzel; Fingerprint Detection, with Lasers, Second edition; Marcel, Dekker, Inc. USA.
4. James F. Cowger; Friction Ridge skin CRC Press London.
5. Mehta, M.K: Identification of Thumb Impression & Cross Examination of Finger Prints, N .M. Tripathi (P) Ltd, Bombay
6. Moenssens: Finger Prints Techniques, Chitton Book Co. Philadelphia, New York.
7. Chatterjee S.K., Speculation in Finger print identification, Jantralekha, Printing Works, Kolkata.
8. Cowger, James F: Friction ridge skin: Comparison and Identification of Fingerprints; CRC Press, Boca Raton, New York.
9. Cook Nancy: Classifying finger prints -Innovative learning publication Mento Par

#### **M.Sc. (Forensic Science) First Year Semester- I [ Level 6.0]**

<b>Code of the Course/ Subject</b>	<b>Title of the Course/Subject</b>	<b>(Total Number of Periods)</b>
<b>FRS 101</b>	<b>Advanced Forensic Science (DSC □ I.1)</b>	<b>60 hrs (4 hrs/week)</b>

**Course Outcomes:** At the end of the course, students will be able to:

1. predict nature and type of crime
2. apply knowledge of fingerprint enhancement in criminal investigation.
3. examine security documents of forensic importance.
4. handle instruments in questioned document analysis.
5. gather information regarding various security services in india.
6. do forensic journalism

#### **Syllabus**

**Unit I: Criminology (7L)**

Crime: definition and types; Theories of Crime: Social Perspective: Differential Association theory, Labelling theory, Social learning Theory, Eysenck's biosocial theory, Substance abuse and crime, Antisocial Personality Disorder & Psychopathy Offending pattern of Criminal Psychopath

**Unit II: Advances in Fingerprint (7L)**

Primary classification, Single digit classification, Henry's ten digit classification, AFIS

Advanced Methods: Radioactive technique, Biological technique, reflected ultraviolet Imaging system, X-ray fluorescence, Chemical imaging

**Unit III: Security Documents (8L)**

Examination of security documents including currency notes, Revenue stamps, travel documents - passports, visas, air - tickets, identity cards, lottery tickets, driving license, Bills, educational and financial documents, etc. different types of security features and their examination including watermarks, wire marks, security fibre/threads, Ghost/imitated marks/ security printing, optical variable inks, holograms and all other security features.

**Unit IV: Analytical Techniques in Questioned Documents (8L)**

Magnifiers, Microscopy, Electrostatic Detection Apparatus, Video Spectral Comparator, Chromatography, Spectroscopy

**Unit V: Forensic Security (8 L)**

Preventive Forensics and their aids, safety gadgets, alarm systems, surveillance systems, Fire precautions, Fire audit, safety of buildings. Need and Scope of internal security of India, Defence against internal and external threats. Surveillance and counter surveillance, honey traps, Ports security.

**Unit VI: Forensic Journalism (7L)**

Introduction, History, Need and Scope, Fundamentals of crime reporting, editing, and writing. Forensic journalism in criminal cases. Case studies for importance of role of Forensic journalism.

**Course Material/Learning Resources**

1. Rev. ED.; Ordway Hilton; Scientific Examination. I of Questioned Documents, Elsevier, New York;
2. Albert S. Osborn; Questioned Documents, Second Ed.; Universal Law Publishing, Delhi;
3. Albert S. Osborn; The Problem of Proof~ Second Ed.; Universal Law Publishing, Delhi;
4. Charles C. Thomas, Typewriting Identification I.S.Q.D.; Billy Prior Bates; Springfield, Illinois, USA
5. Charles C. Thomas, I.S.Q.D. Identification System for Questioned Documents; Billy Prior Bates Springfield, Illinois, USA
6. Wilson R. Harrison; Suspect Documents -Their Scientific Examination; Universal Law Publishing, Delhi
7. Hard less, H.R: Disputed Documents, handwriting and thumbs -print identification: profusely illustrated, Low Book Co., Allahabad
8. Morris, Ron, N: Forensic handwriting identification, Acad Press, London

9. Kurtz Sheila: Graphotypes a new plant on handwriting, analysis, Crown Publishers Inc., USA
10. Lerinson Jay; Questioned Documents, Acad Press, London

**M.Sc. (Forensic Science) First Year Semester- I [ Level 6.0]**

Code of the Course/ Subject	Title of the Course/Subject	(Total Number of Periods)
<b>FRS 102</b>	<b>Forensic Chemistry and Toxicology (DSC □ II.1)</b>	<b>60 hrs (4 hrs/week)</b>

**Course Outcomes:** At the end of the course, students will be able to:

1. handle arson cases
2. identify explosives in bomb blast scenes
3. classify poisons and
4. categorize chemical evidences.
5. estimate hazards caused due to drugs

### Syllabus

**Unit I: Fire & Arson (7L)**

Fire, chemistry of fire, fire behaviour, fire triangle, types of fire, modes of production of fire, Room fire sequence, direction of fire, incendiary devices, fire extinguishers, Analysis of fire/arson crime scene, establishing the origin of fire, patterns and surface effects of char, Accidental fire causes, management of evidences on a fire/ arson crime scene.

**Unit II: Explosives (7L)**

Nature, Classification, Composition and characteristics of Explosive, pyrotechnics, IEDs, Commonly used Explosive devices, Explosion process and effects, types of hazard, effect of blast-wave on structures, humans, etc., Case studies.

**Unit III: Other Chemical Evidences (8L)**

Food and food products, cement, petroleum products, pharmaceutical drugs, beverages, dyes, paints, fibres and ink as chemical evidences found at crime scene, their collection, preservation and analysis, interpretation of findings.

**Unit IV: Narcotic Drug and Psychotropic Substances (8L)**

Introduction, Drug effects, drug Hazards, Tolerance and dependence of drugs, Problems of drug addiction. Identification of a drug addict, drug addicts and crimes, Classification of Narcotics and other drugs, Analytical techniques for identification of drugs.

**Unit V: Forensic Toxicology (8L)**

Introduction and concept of forensic toxicological examination and its significance. Collection and preservation of toxicological exhibits, signs and symptoms of poisoning, mode of action and its effect on vital functions, medico-legal and post mortem examination reports.

**Unit VI: Poisons****(7L)**

Definition, Classification- Plant, Animal, Metallic, etc., Causes of poisoning, Antidotes, Treatments on poisoning, Cases of poisoning

**Course Material/Learning Resources****Reference Books**

1. Klaassen, C. D.: Casarett and Doull's Toxicology: The Basic Science of Poisons, 5th ed., McGraw-Hill, 1995.
2. Moffat, A.C.: Osselton, D. M. Widdop, B.: Clarke's Analysis of Drugs and Poisons in Pharmaceuticals, body fluids and postmortem material, 3rd ed., Pharmaceutical Press 2004.
3. Bogusz, M. J., Hand Book of Analytical Separations, Vol. 2: Forensic Science, 1st ed., Elsevier Science, 2000.
4. Siegel, J.A., Saukko, P. J., Knupfer, G.: Encyclopedia of Forensic Sciences (Vol3), Academic Press, 2000.
5. Rang, P.H., Dale, M.M., Ritter, M.J.: Pharmacology, 4th ed., Harcourt/Churchill Livingstone, 2000.
6. Paranjape, H.M., Bothara, G.K., Jain, M.M.: Fundamentals of Pharmacology, 1st ed., Nirali Prakashan, 1990.
7. Budhiraja, R.D.: Elementary Pharmacology and Toxicology, Popular Prakashan, 2nd ed., 1999.
8. Wiseman, H and Henry J.: Management Of Poisoning, A Handbook for Healthcare workers, 1st ed., A.I.T.B.S, 2002
9. Hardman, J. G. and Limbird, L. E.: Goodman and Gilman's The Pharmacological basis of Therapeutics, 9th edn., McGraw-Hill, 1996
10. Laboratory procedure Manual, Forensic Toxicology: DFS, 2005
11. Sunshine, I ; Methods for Analytical Toxicology, CRC Press USA (1975)
12. Cravey, R.H; Baselt, R.C.: Introduction to Forensic Toxicology , Biochemical Publications, Davis, C.A. (1981) Saferstein, R: Criminalistics - An Introduction to Forensic Science, Prentice Hall, 1995.
13. Bassett: Vogel's Text Book of Quantitative Inorganic Analysis, Longman, 1978
14. Vogel, A. I: Text Book of Practical Organic Chemistry including Qualitative Organic Analysis, ELBS, 1971.
15. Skoog, D. A., West, D. M. and Holler, F. J: Analytical Chemistry: An Introduction, Saunders College, 1994.
16. Stolmen, A.; Progress in Chemical Toxicology: Academic Press, New York (1963)
17. Modi, Jaisingh, P.; Textbook of Medical Jurisprudence & Toxicology, M.M. Tripathi Publication (2001)
18. Eckert; An Introduction to Forensic Science, CRC Press
19. Pillay, V. V.; Handbook of Forensic Medicine and Toxicology, Paras Pub., 2001
20. Curry, A. S: Poison Detection in Human Organ
21. James, S. H. and Nordby, J. J.: Forensic Science: An Introduction to Scientific and Investigative Techniques, 2003.
22. Sarkar, S: Fuels and Combustion, Orient Longman, 1990
23. Verma, R. M: Analytical Chemistry □ Theory and Practice, CBS Pub., 1994

24. Svehla, G. Ed.: Vogel's Qualitative Inorganic Analysis, Longman, 1998.
25. Siegel, J. A, Saukko, P. J. and Knupfer, G. C: Encyclopedia of Forensic Sciences, Academic Press, 2000.
26. Townsends, A. (Ed): Encyclopedia of Analytical Science, Academic Press, 2005 28.
27. Beveridge, A: Forensic Investigation of Explosives, Taylor & Francis, 2000.
28. Yallop, H. J: Explosion Investigation, Forensic Science Society & Scottish Academic Press, 1980. 30. Narayanan, T. V: Modern Techniques of Bomb Detection and Disposal, R. A. Security System, 1995.
29. Yinon, J. and Zitrin, S: The Analysis of Explosives, Oxford: Pergamon, 1981
30. An Introduction to Physics and chemistry of Petroleum
31. Kinghorn: Introduction to Petrochemicals Sukumar Maiti
32. D.W.Waples : Geochemistry in Petroleum Exploration
33. A.L.Waddams : Petroleum Geochemistry and Geology Chemicals from Petroleum
34. Day & Underwood :Analytical Chemistry

### M.Sc. (Forensic Science) First Year Semester- I [ Level 6.0]

Code of the Course/ Subject	Title of the Course/Subject	(Total Number of Periods)
<b>FRS 103</b>	<b>Forensic Physics and Ballistics (DSC- III.1)</b>	<b>60 hrs (4 hrs/week)</b>

**Course Outcomes:** At the end of the course students will be able to

1. analyse paint samples in criminal investigation.
2. handle soil and glass samples.
3. examine physical evidences with forensically sound techniques.
4. interpret voice evidences of suspects.
5. identify wounds caused by firearms.

#### **Unit I: Paints Analysis**

**(7L)**

Types of paints- (Household, Automotive, etc.), Binders and their composition, layers, macroscopic and microscopic examination, pigment distribution, micro-chemical analysis-solubility test, pyrolysis chromatographic techniques, TLC, colorimetry, IR spectroscopy and X-ray diffraction, elemental analysis, interpretation of paint evidence. Matching of layers, obtaining physical fit, Side-by-side comparison, Evaluation of uniqueness. Case Studies (Burglary, Hit and Run, Accidents, etc.)

#### **Unit II: Soil Analysis**

**(7L)**

Formation and types of soil, composition and colour of soil, particle size distribution, turbidity test, microscopic examination, density gradient analysis, elemental analysis, interpretation of soil evidence, Discussion on important case studies of glass & soil. Geo-forensics as an important tool in Forensic Investigations.

#### **Unit III: Glass Analysis**

**(8L)**

Types of glass and their composition, Forensic examination of glass fractures under different conditions, determination of direction of impact: cone fracture, rib marks, hackle marks, backward fragmentation, colour and fluorescence, physical matching, density comparison, physical measurements, refractive index by refractometer, elemental analysis, interpretation of glass evidence. 3-R rule, Sequence of shot determination.

**Unit IV: Other Physical Evidences (8L)**

Forensic Examination of cables, cut wires, locks, keys, real and imitation, jewellery, Ropes, ligature, tungsten filaments, seals (postal, metallic), fuse, fuse wire, stone, brick, debris, construction materials, iron rods, cloth pieces, knot examination, duplicate labels-container identification. Principles & Techniques: specific gravity, density, refractive index, microscopic examination, physical matching, mechanical fit, elemental analysis, etc.

**Unit V: Speaker Identification (8L)**

Speaker identification and tape authentication: voice production theory, Speech signal processing and pattern recognition, acoustic parameters of sound, analogue to digital conversion, Frequency and time domain representation of speech signal, fast Fourier transform, Authentication of audio-video signal, Interpretation of voice evidence and Case studies.

**Unit VI: Ballistics (7L)**

Terminal Ballistics: Introduction, Stopping Power of Bullet, Injuries and the Quantity of Energy of Projectiles, Shockwave and Cavitation Effect, Wounding Mechanism, Elements of Wound Ballistics; Nature of Target, Velocity of Projectile, Constructional Features of Projectile. Range; Classification of Range (Maximum Horizontal/ Vertical, Effective, Dangerous, Safe and Legal Sense), Contact Range, Point blank Range, Near Range, Chips Range, Distant Range. Penetration of Shots in Different Regions of the Body.

**Course Material/Learning Resources**

1. Hand book of Firearms and Ballistics; Brain J. Heard
2. Firearm in Criminal Investigation and Trials; B. R. Sharma
3. Firearms and Forensic Ballistics; S. N. Gaur, B. C. Jauhari
4. Fire Arms, Forensic Ballistics, Forensic Chemistry and Criminal Jurisprudence; S. N. Gaur
5. Forensic Ballistics in Criminal Justice; Kaushalendra Kumar
6. Trace Evidence; Max M. Houck
7. Forensic Science: An Introduction to Scientific and Investigative Techniques; James, Nordby
8. Criminalistics: An Introduction to Forensic Science; Richard Saferstein
9. The Practical Methodology of Forensic Photography; David Redsicker
10. Encyclopedia of Forensic Science; Jay A Siegel, Pekka J Saukko, Geoffery Knupfer
11. Principles of Forensic Medicine & Toxicology; Rajesh Bardale
12. Forensic Medical Investigation of Motor Vehicle Incidence; Michel P. Burke
13. Laboratory Procedural Manual; Physics Section, DFSL, Mumbai
14. Laboratory Procedural Manual; Forensic Ballistics, DFS, New Delhi
15. Advanced Practical Physics; S. P. Singh
16. Practical Physics; Worsnoff and Flint

**M.Sc. (Forensic Science) First Year Semester- I [ Level 6.0]**

<b>Code of the Course/ Subject</b>	<b>Title of the Course/Subject</b>	<b>(Total Number of Periods)</b>
<b>FRS 104 (i)</b>	<b>Questioned Document (DSE□I (i) )</b>	<b>60 hrs (4 hrs/week)</b>

**Course Outcomes:** At the end of the course, students will be able to:

1. Detect forged documents.
2. Distinguish between the genuine and altered documents.
3. Explain security features of documents.
4. Identify source of questioned document.
5. Describe features of handwriting.

**Syllabus:****Unit I: Forgery****(10 hrs)**

Types of forgery, attributes of assisted hand signatures, disguise, discriminators of device, flag of forgery and characters of genuineness, indicators of illiteracy, gender discrimination. Physical constraints, Scope of questioned document examination.

**Unit II: Signatures and Handwriting****(10 hrs)**

Examination of signatures □ characteristics of genuine & forged signatures, examination of buildup of documents, identification of writer of forged writings/signatures. Importance of tremor in identification of writings and signatures, difference between tremors of fraud and genuine tremors in writings and signatures, hesitations, factors responsible for variations (under threat, while travelling, illness, old age, mental state, etc.)

**Unit III: Signatures and Handwriting:****(10 hrs)**

Examination of signatures □ characteristics of genuine & forged signatures, examination of buildup of documents, identification of writer of forged writings/signatures. Importance of tremor in identification of writings and signatures, difference between tremors of fraud and genuine tremors in writings and signatures, hesitations, factors responsible for variations (under threat, while travelling, illness, old age, mental state, etc.)

**Unit IV: Sources of documents****(10 hrs)**

Types and working of Photostat machine, fax machine, printers, scanners. Identification & linkage of Photocopies and photocopier, typewriter, fax machine, scanner, Desktop printing including image processing device, their role in counterfeit currency and certificate etc.

**Unit V: Other Documents****(10 hrs)**

Watermarks, Holographic mark and their examination, Examination of credit, debit and other plastic cards, examination of photocopies, scanned documents, Fax copies etc., and case studies.

**Unit VI: Numismatic forgery****(10 hrs)**

Introduction, tool, equipments and other resource, method of forgery- alteration, tooling, embossing, application and plating, Casting: Rubber mold model, wax model from mold, Burn out wax, treatment of casting, Creating dye- Cutting by hand, plating, casting and hubbing.

### Reference Books

1. Osborn, A. S. : Questioned Documents 1929, Boyd Printing Co., Chicago.
2. Ellen David; Questioned Documents- Scientific Examination, Taylor & Francis, Washington (1997)
3. Roy A Huber, A.M. Headrick; Handwriting Identification- Facts and Fundamental, CRC Press (1999)
4. Morris (2000) : Forensic Handwriting Identification (fundamental concepts and Principals)
5. Madinger J. and zalopany, A.R. (1999) : Money Laundering CRC Press.
6. Manning, C.A (1999) : Financial Investigations and Forensic Accounting CRC Press.
7. Harrison, W.R. : Suspect Documents & their Scientific Examination, 1966, Sweet & Maxwell Ltd., London.
8. Roy A. Huber and A.M. Headrick; Handwriting Identification:- Facts and fundamentals, CRC LLC, 1999.
9. Conway, J.V.P. : Evidential Documents, 1959, Charles C. Thomas, Illinois. 34
10. Hilton, O : The Scientific Examination of Questioned Document, 1982, Elsevier North Holland Inc., New York. Brewster, F. : Contested Documents and Forgeries, The Eastern Law House, Calcutta. 1932.
11. Ordway Hilton; Scientific Examination of Questioned Documents, Rev ED, Elsevier, NY (1982)



**M.Sc. (Forensic Science) First Year Semester- I [ Level 6.0]**

<b>Code of the Course/ Subject</b>	<b>Title of the Course/Subject</b>	<b>(Total Number of Periods)</b>
<b>FRS 104 (ii)</b>	<b>Research &amp; IPR (DSE□I (ii) )</b>	<b>60 hrs (4 hrs/week)</b>

**Course Outcomes:** At the end of the course, students will be able to:

1. formulate the research problem.
2. test the research hypothesis, understand the data collection and prepare the scientific research paper.
3. identify various meta data sources for literature survey.
4. communicate research effectively using various online tools.
5. explore on various ipr components and patent writing.
6. follow moral values while doing research work.

**Syllabus****Unit I: Basics of Research****(10 hrs)**

Meaning of research problem, Definition, Types and Characteristics. Methods of Research: Experimental, Descriptive, Historical, Qualitative and Quantitative methods. Tools of Data Collection - Observation, interview schedule, questionnaire, experimental. Steps of Research. Application of ICT in research.

**UNIT II: Research in Forensic Science I****(10 hrs)**

Identification and criteria of selecting a research problem on Forensic Science (Hypothesis), Formulation of objectives, research plan, and its components. Literature search/review,

**UNIT III: Research in Forensic Science II****(10 hrs)**

Sampling- Principles, methods, types of sampling, rationale for using a particular sampling method. Population and sample size, sampling procedures (random and non-random) with terms of research in Forensic Science.

**Unit IV: Research Ethics****(10 hrs)**

Philosophy and Ethics: Introduction to philosophy and its relevance to research ethics. Ethical principles and moral philosophy in research

Responsible Conduct of Research: Intellectual honesty and integrity in scientific research. Research misconduct: Falsification, fabrication, and plagiarism. Selective reporting and misrepresentation of data

**Unit V: Publication Ethics****(10 hrs)**

Introduction to publication ethics and its importance. Best practices and standards in publication ethics (e.g., COPE, WAME) .Conflicts of interest in research publication. Authorship and contributorship guidelines. Identification and handling of publication misconduct. Predatory publishers and journals. Group discussion on subject-specific ethical issues, authorship, and

conflicts of interest. Introduction to plagiarism detection software (e.g., Turnitin, Urkund Ethical issues.

### Unit-VI: IPR

(10 hrs)

Basic concept of Intellectual Property, Rationale behind Intellectual Property, intellectual property rights and patent law in India. Structure and Components of Indian patents  
Types of IP: Patents, Designs, Trademark, Copyright, technological research, innovation, Techniques of writing a patent.

### Course Material/Learning Resources

1. Research Methodology a step-by-step guide for beginners. Ranjit Kumar, SAGE Publications, 3<sup>rd</sup> Edition, 2011
2. Guide to Publishing a Scientific paper, Ann M. Korner, Bioscript Press 2004.
3. Intellectual Property Rights Under WTO, T. Ramappa, S. Chand, 2008
4. Property Rights, Law and Practice, The Institute of Company Secretaries of India, Statutory Body Under an Act of Parliament, September 2013.
5. Research Methodology: Methods and Techniques, C.R. Kothari, Gaurav Garg, New Age International, 4<sup>th</sup> edition, 2018.
6. Research Methods: the concise knowledge base, Trochim, Atomic Dog Publishing, 2005.
7. Conducting Research Literature Reviews: From the Internetto Paper, Finka, Sage Publications, 2009.
8. Research methodology: an introduction for science & engineering students, Stuart Melville and Wayne Goddard, Juta & Company, 1996.
9. "Philosophy of Science" by A. Bird
10. "A Short History of Ethics" by A. MacIntyre
11. "On Being a Scientist: A Guide to Responsible Conduct in Research" by National Academy of Sciences, National Academy of Engineering, and Institute of Medicine
12. P. Chaddah, "Ethics in Competitive Research: Do Not Get Scooped, Do Not Get Plagiarized"
13. D.B. Resnik, "What is Ethics in Research and Why It Is Important?"
14. J. Beall, "Predatory Publishers are Corrupting Open Access"
15. "Ethics in Science Education, Research and Governance" by Indian National Science Academy (INSA)
16. Intellectual Property in New Technological Age, Robert P. Merges, Peter S. Menell and Mark A. Lemley, Aspen Publishers, 2016.
17. Resisting Intellectual Property, Halbert, Taylor & Francis Ltd, 2007.
18. Industrial Design, Mayall, McGraw Hill, 1992.
19. Product Design, Niebel, McGraw Hill, 1974.
20. Introduction to Design, Asimov, Prentice Hall, 1962.

### Web resources:

1. [https://onlinecourses.nptel.ac.in/noc22\\_ge08/preview](https://onlinecourses.nptel.ac.in/noc22_ge08/preview)
2. [https://www.youtube.com/watch?v=Mb\\_cNqfsdc](https://www.youtube.com/watch?v=Mb_cNqfsdc)
3. <https://www.youtube.com/watch?v=hHHPGLqz6zo>

4. Academic Integrity and Research Quality by the University Grants Commission, [https://www.ugc.gov.in/e-book/Academic%20and%20Research%20Book\\_WEB.pdf](https://www.ugc.gov.in/e-book/Academic%20and%20Research%20Book_WEB.pdf)
5. UGC Guidance Document: Good Academic Research Practices, [https://www.ugc.gov.in/e-book/UGC\\_GARP\\_2020\\_Good%20Academic%20Research%20Practices.pdf](https://www.ugc.gov.in/e-book/UGC_GARP_2020_Good%20Academic%20Research%20Practices.pdf)

**M.Sc. (Forensic Science) First Year Semester- I [ Level 6.0]**

Code of the Course/ Subject	Title of the Course/Subject	(Total Number of Periods)
<b>FRS 104 (iii)</b>	<b>Quality Management [DSE-I (iii) ]</b>	<b>60 hrs (4 hrs/week)</b>

**Course Outcomes:** At the end of the course, students will be able to:

1. learn quality management system.
2. comprehend of various laboratory management.
3. assess the laboratories
4. make report on quality management
5. apply knowledge of guidelines in quality management system

**Syllabus:**

**Unit-I: Quality Management (10 hrs)**

Introduction to Quality, Definition of Accreditation, History and development of ISO Importance of accreditation in Forensic science laboratories, Process of accreditation, Procedure for sample selection, collection, preservation, packaging, identification, storage and transport.

**Unit-II: Material & Method Management (10 hrs)**

Traceability and Validation of new methods, measurement of uncertainty, Equipment maintenance and calibration, Evaluation of materials and reagents, sample and data handling in the laboratory, sample disposal, Assessment, interpretation and reporting of results.

**Unit III: Quality Management in Laboratories (10 hrs)**

Accreditation & Certification: Introduction and objectives, organizations and certifying bodies, NABL, ISO, IEC, BIS. Safety management in laboratories, NABL guidelines for accreditation of laboratories.

**Unit IV: Report Writing (10 hrs)**

Final examination and report writing - opinion writing and writing of reasons for opinion, importance of no opinion / qualified opinion, marking of photographs and their presentation case studies.

**Unit V: Regulatory affairs (10 hrs)**

Basic principles of quality control (QC) and quality assurance (QA), Guidelines for QA and QC: raw materials, products and validation

### Unit VI: Audit

(10 hrs)

Audit: definition, types, process. People involved in audit. Forensic Auditing and its application. Cases

### Course Material/Learning Resources

#### Books

1. Quality Toolbox by Nancy R. Tague
2. Quality Audits for Improved Performance by Dennis R. Arter
3. Quality Audits for Improved Performance by Dennis R. Arter
4. Quality Control for Dummies by Larry Webber and Michael Wallace

### M.Sc. (Forensic Science) First Year Semester- I [ Level 6.0]

Code of the Course/ Subject	Title of the Course/Subject	(Total Number of Periods)
FRS 105	Forensic Science Practical I (based on DSC□II.1 )	60 hrs (4 hrs/week)

**Course Outcomes:** At the end of the course students will be able to

1. Develop methods for development of fingerprints.
2. Make fingerprint powders.
3. Compare fingerprint characteristics.
4. Distinguish documents.
5. Handle instruments which analyse fingerprint and documents.

### Syllabus

#### Part-A

1. Development of latent prints on challenging surfaces.
2. Development of latent prints by powder methods.
3. Classification of fingerprints (single digit)
4. Classification of fingerprints (ten digits)
5. Ridge characteristics of fingerprints.
6. Lifting of prints
7. Documentation of evidences.
8. Chain of custody.

#### Part-B

9. Examination of typescripts/printed matter/ Scanned documents/ fax.
10. Examination of handwriting for individualization.
11. Effect of different surfaces on natural variations in handwriting.

12. Working and handling of Video Spectral Comparator.
13. Working and handling of stereo zoom microscope.
14. Examination of security features of currency notes.
15. Determination of sequence of strokes by VSC.
16. Examination of alterations and obliterations by VSC.
17. Graphological Analysis of handwriting.

### **Examination: FRS 105**

Time : 6-8 Hrs. (One day Examination)

Total Marks : 100

<b>A.</b>	<b>Exercise-I (Part-A)</b>	<b>20</b>
<b>B.</b>	<b>Exercise-II (Part- B)</b>	<b>20</b>
<b>C.</b>	<b>Viva (External + Internal)</b>	<b>10</b>
<b>D.</b>	<b><u>Internal assessment*</u></b>	<b><u>50</u></b>
<b>Total</b>		<b>100</b>

\*- Internal assessment will be continuous and based on the performance of a student throughout the session along with satisfactory submission of the term work

### **Course Material/Learning Resources:**

#### **Reference Books**

1. Trace Evidence; Max M. Houck
2. Laboratory Procedural Manual; Physics Section, DFSL, Mumbai
3. Advanced Practical Physics; S. P. Singh
4. Practical Physics; Worsnoff and Flint
5. David R. Ashbaugh; Quantitative and Qualitative Friction Ridge Analysis, CRC Press
6. Cook Nancy: Classifying finger prints -Innovative learning publication Mento Par
7. Rev. ED.; Ordway Hilton; Scientific Examination. I of Questioned Documents, Elsevier, New York;
8. Albert S. Osborn; Questioned Documents, Second Ed.; Universal Law Publishing, Delhi;
9. Morris, Ron, N: Forensic handwriting identification, Acad Press, London
10. Santosh G. Badne, Bhupeshkumar V. Nanhe & Asmita S. Satao; Handbook of Forensic Science; DnyanPath Publications;

**M.Sc. (Forensic Science) First Year Semester- I [ Level 6.0]**

<b>Code of the Course/ Subject</b>	<b>Title of the Course/Subject</b>	<b>(Total Number of Periods)</b>
<b>FRS 106</b>	<b>Forensic Science Practical II (Lab 02) (based on DSC-III.1)</b>	<b>60 hrs (4 hrs/week)</b>

**Course Outcomes:** At the end of the course students will be able to

1. Apply knowledge to determine density of glass.
2. Create methods for estimation of broken pieces of objects.
3. Examine physical evidences scientifically.
4. Distinguish tool marks.
5. Identify wound marks.

**Syllabus:**

1. Density gradient analysis of soil samples.
2. Determination of density of glass by specific gravity bottle method.
3. Examination of glass fractures.
4. Restoration of erased identification marks.
5. Determination of refractive index of glass and liquid.
6. Physical matching of broken pieces of different objects.
7. Determination of tensile strength of rope/dupatta.
8. Physical examination of paint samples.
9. Comparison of tool marks.
10. Classification of wounds caused by firearms.

**FRS 106 Forensic Science Practical II  
(Lab 02)**

Time : 6-8 Hrs. (One day Examination)

Total Marks : 100

<b>A. Exercise-1</b>	<b>20 Marks</b>
<b>B. Exercise-2</b>	<b>20 Marks</b>
<b>C. Viva-Voce</b>	<b>10 Marks</b>
<b>D. Internal *</b>	<b>50 Marks</b>

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Total -100 Marks

\*- Internal assessment will be continuous and based on the performance of a student throughout the session along with satisfactory submission of the term work.

**Course Material/Learning Resources:**

1. J. B. Yadav, Practical Physical Forensic Science
2. Das and Behra, Practical Physical Forensic Science
3. Carl W. Garland, Joseph W. Nibler and David P. Shoemaker, Experiments in Physical Forensic Science, Mc-Graw Hill, 8<sup>th</sup> Edition, 2009.

4. Farrington Daniels, Joseph Howard Mathews, John Warren Williams, Paul Bender, Robert A. Alberty, Experimental Physical Forensic Science, Mc-Graw Hill, Fifth Edition, 1956.
5. John W. Shriver and Michael George, Experimental Physical Forensic Science, Lab Manual and Data Analysis, The University of Alabama in Huntsville, Fall 2006
6. Jahgirdar D.V: Experiments In Forensic Science

**M.Sc. (Forensic Science) First Year Semester- II [ Level 6.0]**

<b>Code of the Course/ Subject</b>	<b>Title of the Course/Subject</b>	<b>(Total Number of Periods)</b>
<b>FRS 201</b>	<b>Forensic Engineering (DSC-I.2)</b>	<b>60 hrs (4 hrs/week)</b>

**Course Outcomes:** At the end of the course, students will be able to:

1. Differentiate between the evidences found in forensic engineering cases.
2. Investigate the crime scenes in scientifically sound manner.
3. Examine the evidences of various cases.
4. Reconstruct the crime scene of motor vehicle fire and explosion crime scenes.
5. Collect and Preserve the evidences in motor vehicle accidents.

**Syllabus:**

**Unit-I: Introduction to forensic engineering (7L)**

Cement, Types of cement and their composition, determination of adulterants by physical, chemical and instrumental methods, examination of brick, analysis of Bitumen & road materials, analysis of cement mortar and cement concrete & stones, forensic examination of electrical appliances installations.

**Unit-II Introduction to forensic engineering and scientific investigation (7L)**

Investigation and observation of collapsed structures and causes of failure Examination of structural parameters (beam, column, slab, foundation, ties, reinforcements and reinforcement cover etc.), with reference to building code of construction applicable at the time of construction of structures and I.S standards

**Unit-III Examinations in Forensic Engineering (8L)**

Examination the approved design and comparison of the design and structural parameters Examination of the basic materials like cement, sand, brick, grit, steel, quality of water, cube rest and curing etc Sampling of the materials with relevant information required for the investigation (column, beam, slab, mortar, bricks, reinforcement steel, soil and basic materials used in the construction, Case studies

**Unit-IV Motor vehicle fire (8 L)**

Investigation, Reconstruction and report writing Collection and preservation of fire evidence. Case studies

**Unit-V Explosion (8 L)**

Investigation Reconstruction and report writing Collection and preservation of explosion evidence. Case studies.

**Unit-VI Motor vehicle accident (7 L)**

Introduction Primary causes of accidents Analytical tools used to evaluate accidents Converting scene data into event sequence Measurement of speed of the vehicle Reconstruction of the scene Collection and preservation of the evidences



**Textbook & Reference Books:**

1. Dahiya. M.S. (2009): Crime scene management □ A scientific approach
2. Kirk (2000): Vehicular accident Investigation and reconstruction
3. Noon (2000): Forensic Engineering Investigation
4. Carper (2000): Forensic Engineering
5. James, Nordby (2005): Forensic Science an introduction to scientific investigative technique

**M.Sc. (Forensic Science) First Year Semester- II [ Level 6.0]**

<b>Code of the Course/ Subject</b>	<b>Title of the Course/Subject</b>	<b>(Total Number of Periods)</b>
<b>FRS 202</b>	<b>Communication &amp; Report Writing (DSC II.2)</b>	<b>60 hrs (4 hrs/week)</b>

**Course Outcomes:** At the end of the course, students will be able to:

1. differentiate various forms of communication.
2. develop effective listening and speaking skills.
3. write writing research papers and review articles.
4. recognize genuine and fraudulent documents.
5. communicate effectively at their respective workplaces, following the ethics.

**Syllabus****Unit I: Fundamentals of Communication (7L)**

Communication: Meaning, types and characteristics of communication, Role and purpose of communication: 7 C□s of communication, Barriers to effective communication, Forms of Communication: one-to-one, informal and formal, Verbal and Non-verbal, Inter-Cultural and group communications, Classroom communication, Mass-Media and Society.

**Unit II: Listening, Speaking Skills (7L)**

Effective Listening: Principles and Barriers, Listening Comprehension on International Standards, Enhancing listening

Speaking Skills: Pronunciation and Accent, Reading excerpts from news dailies & magazines, Extempore, Conversational English, Effective presentation: Planning, design and layout of presentation, Information Packaging, Audience analysis, Audio visual aids, Speaking with confidence, Case Studies. Business Conversation, Effective Public Speaking

**Unit III: Writing Skills (8L)**

Writing Skills: Mechanics and Semantics of Sentences, Writing effective sentences, Style and Structure, Writing Paragraphs, Précis Writing, Letter writing, Netiquette, Essay writing, Inter-office communication: Business Letter; Emails; Intra office communication: Memos, Notices, Circulars, Minutes.

**Unit IV: Documentary Evidences (8L)**

Medical certificate, Medical report, Medico legal certificate, Medico legal report, Dying declaration, Dying deposition, Birth certificate, Death certificate, etc. Format of documentary evidences. FIR, Inquest reports, Risk assessment report. Accreditation of Forensic Science Laboratory, Types of fraud in competitive examinations, Case Discussion on important and widespread cases.

**Unit V: Workplace Speaking (8L)**

Types of Interview, Styles of Interview, Question Answer on Various Dimensions Work Place Speaking: Team Briefing, Conflict Management, Negotiations, Participation in Meetings, Keynote Speeches. Ethics and scientific conduct: Intellectual Property right and Plagiarism; Patents, Trademarks, Copyrights, etc.

**Unit VI: Research Report Writing (7L)**

Format of research paper, review paper and report writing, Procedure of Reference Citation; Significance of writing research papers and review articles; Major Scientific publishers; Impact factor and citation index.

**Course Material/Learning Resources**

**Books**

1. G. S. Hook; Communication Skills Training
2. Sarah Angela; Emotional Intelligence
3. Charles Covey and Dale Manson; Communication Psychology
4. Richard Bowl; Communication Skills
5. Ronald Vincent; Mastering Communication Skills

**M.Sc. (Forensic Science) First Year Semester- II [ Level 6.0]**

Code of the Course/ Subject	Title of the Course/Subject	(Total Number of Periods)
FRS 203	Forensic & Correctional Psychology (DSC □ III.2)	45 hrs (3 hrs/week)

**Course Outcomes:** At the end of the course, students will be able to:

1. differentiate between learning methods.
2. assess the human behavior experimentally.
3. Recollect the functioning of brain and nervous system.
4. Evaluate personality of individuals.
5. Explain personality disorders.
6. Memorize memory processes and types.

**Syllabus**

**UNIT I: Biological Foundation of Behaviour, Learning, Memory (7 L)**

Neuron & Nervous System: Structure, function, synapse, and neurotransmitters; Central Nervous, Peripheral Nervous System, Autonomic Nervous System, Somatic Nervous system; Gestalt principles of perception

**UNIT II- Assessment, Evaluation Interviewing and Interrogation (7 L)**

Difference between clinical and forensic evaluation Forensic assessment; Clinical interview, Mental Status examination, Psychological Tests: Intelligence, Achievement and Aptitude tests, Personality tests (projective techniques and inventories), Neuropsychological Tests. Application of psychology tests to civil and criminal proceedings

**UNIT III: Correctional Psychology (8 L)**

Correctional facilities, Psychological assessment in corrections, Psychological treatment (i) Behavioral model (ii) Cognitive behavioural model, Community based intervention (rehabilitation), Juvenile correction: an overview, Psychological evaluation of juvenile offenders, Approaches to juvenile Rehabilitation (i) Group home model (ii) Family prevention models: homebuilders, Multisystem therapy, functional family therapy (iii) Boot Camps, Violence prevention program. Rehabilitation & Correctional Treatment of Offender(s) / Victim(s), Techniques, Strategies and Types of Treatments.

**Unit IV: Elements of Forensic Psychiatry (8 L)**

Forensic Psychiatry: Introduction to different mental illnesses; neurosis (depression, mood disorder, Insanity, Psychosis, Delusion, delirium, schizophrenia), Impulsive control stress disorder, Anti-social personality disorder, psychopathy, Post traumatic stress disorder and post-partum stress disorder. Substance Abuse, Association between mental disorder and crime, Mc Naughten rule, diminished responsibility, testamentary capacity.

**Unit V: Learning and Memory (8L)**

Learning: Definition, Classical Conditioning: Pavlov's experiment, extinction, spontaneous recovery, generalization, discrimination, higher-order conditioning, Operant Conditioning: Thorndike's Laws of learning, Skinner's experiment, positive reinforcer, negative-reinforcer, Bandura's Observation Learning Theory.

Memory: definition and Process, The information-processing model: Three stages of memory (i) Sensory (ii) Short-term (iii) Long term, Types of long term memory- Procedural, Declarative (episodic, semantic), Explicit and implicit.

**Unit VI: Investigative Psychology (7 L)**

Polygraph/Lie Detector Test, Brain Fingerprinting/Brain-Mapping, Narco-analysis; Case studies. Importance of Investigative Interviewing, Influence of Psychology, P.E.A.C.E Model of Interviewing, Cognitive Interviewing, Ethical Interviewing, Other Interview Techniques. Interrogation and the related Techniques.

**Course Material/Learning Resources:**

1. Psychology, (2006) Ciccarelli, S. K. & Meyer G. E. New Delhi; Pearson Education 8. □Social Psychology□, Robert A. Baron & Nyla R. Branscombe, Pearson Education, India.
2. Introduction to Psychology, (1986) Morgan C.T., King R.A., Weisz J.R., Schopler J., McGraw-Hill Book Co.
3. Principles of General Psychology, 3rd ed. Kimble G.A., Garnezy, , New York

4. Psychology, (2001), Baron R.A. New Delhi; Pearson Education Pvt.Ltd.
5. Cognitive Psychology Mind and Brain□, Edward E. Smith, Stephen M. Kosslyn, New Delhi, Pearson Education
6. Invitation to Psychology, Parameswaran, E.G., BeenaC.Tata McGraw-Hil, New Delhi.
7. Psychology-An Introduction, Thakkar P., Dr. Ambekar A.
8. Handbook of Forensic Psychology□, Prof Dr. Vimala Veeraraghwan, Edition 1st, 2009, Selective and Scientific Books Publications, New Delhi
9. □Introduction to Forensic Psychology-Research and Application□, Curt R. Bartol, Anne M. Bartol, Editon 2nd, 2008, Sage Publication.
10. □Handbook of Forensic Psychology□, Irving B. Weiner, Allen K. Hiss, Edition 3rd, 2006, Wiley Publication.
11. □Forensic Psychology□, Solomon M. Fulero & Lawrence S. Wrightsman, Third edition, 2009, Wadsworth, Cengage learning publication, United States of America.
12. □Forensic and Criminal Psychology□, Dennis Howitt, 2002, Pearson Education LTD, England.
13. E., Tett, R. P., Vandecreek, L. (2003). Psychological testing and the selection of police officers: A National Survey. Criminal Justice and Behavior, 30(5), 511-537.
14. □Forensic Criminology□, Petherick W. A., Turvey B. E., Ferguson C. E., [2010], Elsevier Inc. □Psychological Interventions of Mental Disorders□, S. K. Shrivastava, Nayanika Singh, Shivani Kant, Edition 1st, 2013, Sarup Book Publishers, PVT. LTD.
15. Abnormal Psychology, Irwin G. Sarason & Barbara R. Sarason, Edition 11th, PHI Learning Private Limited, New Delhi.
16. Barlow & Durand. V. M. (2005) Abnormal Psychology, 6th Ed. New Jercey
17. □Criminology□, Digumarti Bhaskara Rao, First Edition 1st, 2012, Discovery Publication House PVT. LTD., New Delhi.
18. □Human Aggression-theory, research and intervention□, Sunil Saini, Nilam Goyal, Edition 1st Global Vision Publication House, New Delhi.
19. □Psychological Testing□, Anne Anastasi, Susana Urbina, Edition 7th, 2010, PHI Learning PRI. LTD, New Delhi
20. □Applied Criminology-Concept, Theories and Applications□, Joseph Ronald, Edition 1st, 2013, Cyber Tech publications, New Delhi.
21. □Criminology and Penology□, Mittal S., Saxena S. K., [2012], Commonwealth Publishers Pvt. Ltd., New Delhi.
22. Principles of Social Psychiatry□, Craig Morgan, Dinesh Bhugra, Edition 2nd, 2010, Wiley Blackwell Publication
23. Introduction to Forensic Psychology-Research and Application□, Curt R. Bartol, Anne M. Bartol, Editon 2nd, 2008, Sage Publication.
24. □Handbook of Forensic Psychology□, Irving B. Weiner, Allen K. Hiss, Edition 3rd, 2006, Wiley Publication.
25. □Forensic Psychology□, Solomon M. Fulero & Lawrence S. Wrightsman, edition 3rd, 2009, Wadsworth, Cengage learning, United States of America.
26. □Forensic and Criminal Psychology□, Dennis Howitt, 2002, Pearson education Publication.
27. □Introduction to Forensic Psychology-Research and Application□, Curt R. Bartol, Anne M. Bartol, Editon 2nd, 2008, Sage Publication.
28. Barlow & Durand. V. M. (2005) Abnormal Psychology, 6th Ed. New.
29. Prof. Paranjape N. V., Criminology and Penology, Central Law Publication, Allahbad.

30. Kocsis, R. N. (2003). Criminal psychological profiling: Validities and abilities. *International Journal of Offender Therapy and Comparative Criminology*, 47 (2), 126-144.

**M.Sc. (Forensic Science) First Year Semester- II [ Level 6.0]**

<b>Code of the Course/ Subject</b>	<b>Title of the Course/Subject</b>	<b>(Total Number of Periods)</b>
<b>FRS 204 (i)</b>	<b>Forensic Biology [DSE-II (i)]</b>	<b>45 hrs (3 hrs/week)</b>

**Course Outcomes:** At the end of the course, students will be able to:

1. recollect the composition of different body fluids.
2. collect biological evidences from crime scene.
3. preserve biological evidences for criminal investigation.
4. understand the concept of DNA fingerprinting.
5. analyse botanical evidences collected from crime scene vicinity.

**Syllabus****Unit I: Body Fluids****(10 hrs)**

Composition, formation and function. Collection and preservation of biological fluids. Types and distribution of body fluids (semen, synovial fluid, gastrointestinal secretions tears, milk, faeces, saliva, aqueous humour, Vaginal fluid, epithelial cells, etc.)

**Unit II: Blood:****(10 hrs)**

Blood composition , Blood group antigens the classification of blood cell antigens, Forensic significance of ABO blood group , Hh blood group, Rh blood group, Kell blood group, Duffy blood group, Kidd blood group, Diego blood group, MNS blood group, etc.

**Unit III: Biological Evidences****(10 hrs)**

Nature & Type of Biological evidences (Both animal & plant origin), Hairs. Differences between animal and human hair, Forensic examination of different types of hair. Histopathology of various tissues. origin, grouping, etc.

**Unit IV: Serological Evidence Examination****(10 hrs)**

Preliminary and Confirmatory tests for human body fluids (blood, semen, tears, milk, faeces, saliva, aqueous humour, Vaginal fluid, epithelial cells)

**Unit V: Botanical evidences****(10 hrs)**

Different botanical evidences of forensic significance; Leaves, seeds, pollens, Paper and Paper Pulp identification, Microscopic and biochemical examination of pulp material etc. Diatoms: Isolation of diatoms from various body organs, long bones and their forensic significance in drowning cases.

**Unit VI: Individualization with biological samples****(10 hrs)**

Introduction to DNA profiling, extraction/isolation of DNA from stains, tissues, hair, nails, buccal swabs, blood, semen and other samples. FTA cards for isolation of DNA. DNA typing systems length polymorphisms, short tandem repeats and single nucleotide polymorphisms.

## Course Material/Learning Resources

### Reference Books

1. Criminalistics: An Introduction to Forensic Science (2014) Saferstein, Pearson Prentice Hall Inc. USA, ISBN-13: 978-0133458824
2. James, S.H. And Nordby, J. J.; Forensic Science; An Introduction to Scientific and Investigative Techniques, CRC Press USA
3. Laboratory Procedure Manual - Forensic Biology (2005), Directorate of Forensic Science, MHA, New Delhi
4. Lehninger Principles of Biochemistry 6th Edition (2012) □ Nelson and Cox, W.H. Freeman, ISBN: 978-1429234146
5. Molecular Biology of the Cell, 6th Edition (2014) □ Bruce Alberts, et al., Garland Science, ISBN: 978-0815341055
6. Forensic DNA Typing, Second Edition: Biology, Technology, and Genetics of STR Markers 2nd Edition (2005) - John M. Butler, Academic Press, ISBN:0121479528
7. Forensic Science: An Introduction to Scientific and Investigative Techniques □ Stuart H. James, Jon J. Nord by, CRC Press, ISBN:0849327474

### M.Sc. (Forensic Science) First Year Semester- II [ Level 6.0]

Code of the Course/ Subject	Title of the Course/Subject	(Total Number of Periods)
FRS 204 (ii)	Digital Forensics [DSE - II (ii)]	60 hrs (4 hrs/week)

**Course Outcomes:** At the end of the course, students will be able to:

1. memorize investigation of cybercrimes.
2. operate tools of forensic importance.
3. secure information on the devices and network.
4. examine mobile devices.
5. detect and prevent threats over the internet.

### Syllabus:

#### Unit I: Introduction

(10 L)

Internet & web technologies, web hosting and development, attributes in cyberspace and legal framework of cyberspace, hacking, virus, obscenity, pornography, programme manipulation, Copyright, Patent, software piracy, intellectual property rights, trademark, domain disputes, and computer security, etc.

#### Unit II: Digital Forensic Investigation

(10 L)

Identification of digital evidences, Search and seizures of evidence, necessary documentations such as Chain of Custody, pre-acquisition forms etc., Digital evidence handling at crime scene as per standards, Collection/Acquisition and preservation of digital evidences, Processing & analysis, Compilation of findings & Reporting, Pre-requisite for setting up Digital Forensic lab

and global standards. Investigation of cybercrimes and tools for analysis. Encryption and Decryption methods. Crptography: definition, types. Steganography

**Unit III: Operating systems & Tools of forensic importance (10 L)**

Understanding of Windows, Linux & Macintosh operating systems, Understanding of mobile operating systems such as android, iOS, Windows, Blackberry etc., Deleted data recovery techniques: EnCase, Forensic Toolkit (FTK), The Sleuth kit, Open source tools, Registry Analysis, Understanding Windows Registry and Registry Structure.

**Unit IV- Mobile Forensic Analysis: (10 L)**

Mobile Forensics Cell phone and mobile device forensics, Understanding Mobile device forensics, Understanding acquisition procedure, Cell phone Crimes, SIM Architecture, Data Storage, Data Extraction, Files Stored on SIM, Handling Mobile Devices as Sources of Evidence, Forensic Preservation of Mobile Devices, Forensic Examination and Analysis of Mobile Devices, Forensic Acquisition and Examination of SIM Cards, Investigative Reconstruction Using Mobile Devices Future trends

**Unit V: Imaging / acquisition & data recovery (10 L)**

Acquisition of stand-alone machine, peripheral device, other storage media, CCTV, systems (both physical & logical), Acquisition or triage collection of live system, Acquisition of mobiles, PDA's, Tablets, Navigation systems etc., Acquisition over the network i.e. remote acquisition, Understanding of various acquisition software/hardware device, details of various file formats of forensic image, Deleted data recovery techniques.

**Unit VI: Registry and Logging (10 L)**

Understanding and in-depth analysis of registry in various operating systems, Log analysis with respect to standalone machine and server, which includes event logs, ftp/sftp, pplication, Web Servers/ Proxy logs.

**Course Material/Learning Resources:**

1. Gonzalez & Woods, Digital Image Processing, Pearson Education Publication
2. Tinku Acharya and Ajay K Ray, Image Processing Principal and Application, Wiley Publication
3. Computer Forensic Investigating Data and Image Files, EC Council Press
4. Forouzan Data Communication and Networking McGraw Hill
5. Jochen Schiller Mobile Communication Addison Wisely Pearson Eduction
6. Robert Jones, Internet Forensics Using Digital Evidence to Solve Computer Crimes, O'Reilly Media Publication
7. Stuart Mc Clure, Joel Scrambray, George Kurtz, 'Hacking Exposed', Tata McGraw-Hill, 2003 24. Matt Bishop, 'Computer Security Art and Science', Pearson/PHI, 2002.'



**M.Sc. (Forensic Science) First Year Semester- II [ Level 6.0]**

<b>Code of the Course/ Subject</b>	<b>Title of the Course/Subject</b>	<b>(Total Number of Periods)</b>
<b>FRS 204 (iii)</b>	<b>Cyber Security [DSE - II (iii)]</b>	<b>60 hrs (4 hrs/week)</b>

**Course Outcomes:** At the end of the course, students will be able to:

1. Define and explain the key terms and concepts in Cyber Forensics.
2. Manage security over the network.
3. Apply the knowledge of biometrics in criminal investigation.
4. Secure the digital devices and networks.
5. Create awareness regarding cyber security among the citizens.

**Syllabus:**

**Unit I: Information security**

**(10 hrs)**

Domains, Common Attacks, Impact of Security Breaches. Protecting Critical Systems (Information Risk Management, Risk Analysis, etc.) Information Security in Depth Physical security (Data security Systems and network security) Program Security: Secure programs, Non-malicious program errors, Viruses and other malicious code, Targeted malicious code, Controls against program threats File protection mechanism, Authentication: Authentication basics, Password, Challenge-response, Biometrics.

**Unit II: Database Security**

**(10 hrs)**

Introduction to Database, Basics of SQL, Security requirements, Reliability and integrity, Sensitive data, Interface, Multilevel database, Proposals for multilevel security Cloud Computing- Its Forensic and Security Aspects

**Unit III: Network Forensics**

**(10 hrs)**

Collecting Network Based Evidence - Investigating Routers - Network Protocols - Email Tracing - Internet Fraud. Systems Investigation and Ethical Issues. Data Analysis Techniques - Investigating Live Systems (Windows & UNIX) - Investigating Hacker Tools - Ethical Issues □ Cybercrime. Report Writing Guidelines, A Template for Digital and Cyber Forensics report.

**Unit IV: Network Security**

**(10 hrs)**

Threats in networks, Network security control, Firewalls, Intrusion detection systems, Secure e-mail, Networks and cryptography, Example protocols: PEM, SSL, IPsec. Principles of network forensics, Attack Traceback and attributes, Critical Needs Analysis. IDS: Network based Intrusion Detection and Prevention Systems, Host based Intrusion Prevention System.

**Unit V: Biometrics:**

**(10 hrs)**

Introduction, Physiological or Behavioural, Verification vs Identification, Applications, Biometrics Technologies, Working of Biometrics, Benefits, Application Design. Multi-Modal Biometrics: Introduction to Multi-Modal Biometric Systems, Fusion Methodology, Levels of Fusion, Feature-Extraction Level Fusion, DataMatching Level Fusion, Probabilistic-Decision level Fusion, Fusion Procedure, Modes of Operation, Integration Strategies, Design Issues, Soft Biometrics, A Biometric Vision.

### **Unit VI: Fingerprint & Face Recognition**

**(10 hrs)**

What Is Fingerprint Scanning? Practical Applications for Fingerprint Scanning, Accuracy and Integrity, Fingerprint Matching, Fingerprint Classification, Fingerprint Image Enhancement, Fingerprint Feature Extraction, Fingerprint Form Factors, Types of Scanners: Optical - Silicon □ Ultrasound, Fingerprint Matching.

Introduction to Face Recognition, How is Face Recognition Technology Currently Being Used? How Well Does Face Recognition Work, Why Face Recognition, Face Recognition: How it Works, Image Quality, Facial Scan Process Flow, Verification vs. Identification, Primary Facial Recognition Technologies, Facial Recognition Applications

### **Text & Reference Books & Journals:**

1. John R. Vacca, Network and System Security, Syngrees Publication
2. Stallings, □Cryptography And Network Security: Principles and practice□
3. C. P. Pfleeger, and S. L. Pfleeger, □Security in Computing□, Pearson Education.
4. Matt Bishop, □Computer Security: Art and Science□, Pearson Education.
5. Kevin Mandia, Chris Prosis and Matt Pepe, Incident response and computer forensics, McGraw Hill Publication
17. Stallings, □Cryptography And Network Security: Principles and practice□
6. C. P. Pfleeger, and S. L. Pfleeger, □Security in Computing□, Pearson Education.
7. Matt Bishop, □Computer Security: Art and Science□, Pearson Education
8. Cory Altheide, Harlan Carvey, Digital Forensics with Open source Tools, Syngress Publication
9. Michael E Whitman and Herbert J Mattord, □Principles of Information Security□, Vikas Publishing House, New Delhi, 2003
10. Micki Krause, Harold F. Tipton, □Handbook of Information Security Management□, Vol 1-3 CRC Press LLC, 2004.

**M.Sc. (Forensic Science) First Year Semester- II [ Level 6.0]**

<b>Code of the Course/ Subject</b>	<b>Title of the Course/Subject</b>	<b>(Total Number of Periods)</b>
<b>FRS 205</b>	<b>Forensic Science Practical III (based on DSC II.2)</b>	<b>60 hrs (4 hrs/week)</b>

**Course Outcomes:** Upon completing this Forensic Science Practical course, students will be able to:

1. Demonstrate proficiency in communication
2. Develop good scientific writing skills.
3. Speak effectively in public.
4. Make proper resume/CV/ Biodata.
5. Face interviews with efficiency.

### **Syllabus**

#### **Communication & Report writing**

1. To study the format of Forwarding letter with the help of a case example.
2. To write forwarding letter in case of Murder/Rape/Assault/HBT/Asphyxial death.
3. To write scientific report in case of Murder/Rape/ hit and run.
4. To study the barriers to effective communication with the help of activities.
5. To speak in Public speaking on topic of relevance.
6. To make an effective Presentation using the various aids.
7. To write an application for the given post/designation in an organisation.
8. To make the Curriculum Vitae/Resume/Bio-data in the given format.
9. To summarise the given essay/forensic report.
10. To study the Post-mortem examination report.
11. To examine the given documents in case of fraud. (OMR sheet/Attendance sheet/admit card)
12. To study the different styles of Interview.
13. To use the various tools/plagiarism checking software.
14. To study the forensic aspects of relevant popular cases involving fraud.

#### **Examination: FRS 205 Forensic Science Practical III**

##### **(Lab 03)**

Time : 6-8 Hrs. (One day Examination)

Total Marks : 100

<b>A.</b>	<b>Exercise-I</b>	<b>20</b>
<b>B.</b>	<b>Exercise-II</b>	<b>20</b>
<b>C.</b>	<b>Viva (External + Internal)</b>	<b>10</b>
<b>D.</b>	<b>Internal assessment*</b>	<b>50</b>
	<b>Total</b>	<b>100</b>

\*- Internal assessment will be continuous and based on the performance of a student throughout the session along with satisfactory submission of the term work

**Books**

6. G. S. Hook; Communication Skills Training
7. Sarah Angela; Emotional Intelligence
8. Charles Covey and Dale Manson; Communication Psychology
9. Richard Bowl; Communication Skills
10. Ronald Vincent; Mastering Communication Skills

**M.Sc. (Forensic Science) First Year Semester- II [ Level 6.0]**

<b>Code of the Course/ Subject</b>	<b>Title of the Course/Subject</b>	<b>(Total Number of Periods)</b>
<b>FRS 206</b>	<b>Forensic Science Practical IV (Lab 04) (based on DSC□III.2 )</b>	<b>60 hrs (4 hrs/week)</b>

**Course Outcomes:** Upon completing this Forensic Science Practical course, students will be able to:

1. Demonstrate psychological tests on individual.
2. Measure intelligence of people.
3. Test the nature of humans.
4. Assess personality of individual.

**Syllabus**

**Forensic Psychology**

1. Rotters Locus of control Scale
2. Bhatia Battery of Intelligence
3. House-Tree-Person Test
4. Level of Aspiration
5. Control Questions Technique using Lie detector Test
6. 16 Personality Factor Test
7. MMPI/Multiphasic Personality Questionnaire (MPQ)
8. Sentence Completion test (Adult)
9. Picture Frustration Test (Adult) (Indian adaptation)

**Examination: FRS 206 Forensic Science Practical IV**

**(Lab 04)**

Time : 6-8 Hrs. (One day Examination)

Total Marks : 100

<b>A.</b>	<b>Exercise-I</b>	<b>20</b>
<b>B.</b>	<b>Exercise-II</b>	<b>20</b>
<b>C.</b>	<b>Viva (External + Internal)</b>	<b>10</b>
<b>D.</b>	<b><u>Internal assessment*</u></b>	<b><u>50</u></b>
	<b>Total</b>	<b>100</b>

\*- Internal assessment will be continuous and based on the performance of a student throughout the session along with satisfactory submission of the term work

**Course Material/Learning Resources:**

**Reference Books**

1. Psychology, (2006) Ciccarelli, S. K. & Meyer G. E. New Delhi; Pearson Education 8. □Social Psychology□, Robert A. Baron & Nyla R. Branscombe, Pearson Education, India.
2. Introduction to Psychology, (1986) Morgan C.T., King R.A., Weisz J.R., Schopler J., McGraw-Hill Book Co.
3. □Psychological Testing□, Anne Anastasi, Susana Urbina, Edition 7th, 2010, PHI Learning P.R.I. LTD, New Delhi
4. Test, Measurement and research methods in behavioral science by A.K. Singh
5. Serial Crime, Theoretical & Practical issues in behavioural profiling, Petherick, Woodworth Publications.
6. □Psychological Testing□, Anne Anastasi, Susana Urbina, Edition 7th, 2010, PHI Learning P.R.I. LTD, New Delhi  
Experiments and technique in organic experiments- D. Pasto, C. Johnson and M. Miller prentice Hall.