SHRI VAISHNAV VIDHYAPEETH VISHVAVIDHYALAYA, INDORE

M.Sc. / B.Sc.-M.Sc. (Forensic Science) CBCS

Semester-IV / X (M.Sc. / B.Sc.-M.Sc.)

Name of Program M.Sc. / B.Sc.-M.Sc. (Forensic Science)

Subject Code	Category	Subject Name	TEACHING & EVALUATION SCHEME								
			THEORY			PRACTICAL		L	T	P	Credits
			End Sem University Exam	Two Term Exam	Teachers Assessment*	End Sem University Exam	Teachers Assessment*				
MSCFS–401	DC	Emerging trends in Forensic Science.	60	20	20	30	20	4	1	2	6

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit;

***Teacher Assessment shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.**

Learning Objectives: After studying this Paper the Students will Know-

1. DNA and its Role in Identification
2. Techniques used for Lie detection
3. Importance of Biometrics in personal identification
4. Importance of Environmental Forensics
5. Concept of Bioterrorism and Bio security

Unit I: Structure of DNA, Techniques in DNA typing, RFLP, PCR, Factors affecting DNA, Damage to DNA, Variation in DNA, DNA as excellent polymorphic marker, Basis of DNA typing, Introduction to touch DNA- its future prospectus.

Unit II: Basics of Narco analysis and its significance in forensic science, Brain fingerprinting and its use in the criminal identification, Polygraph analysis , Voice production theory-vocal anatomy, Speech signal processing & pattern recognition- basic factors of sound in speech, acoustic characteristics of speech signal, Basic introduction to computers forensics, hardware and accessories, operating system and software.

Unit III: Biometrics in Personal Identification: Introduction, Concepts of Biometric Authentication, Role in person Identification, Techniques and Technologies (Finger Print Technology, Face Recognition, IRIS, Retina Geometry, Hand Geometry, Cheiloscopy, Rugoscopy, Poroscopy, Ridgeology, Signature Verification and other forensic related techniques).

Unit IV: Environmental Forensics: Definition, Legal processes involving environmental forensic science. Geo-forensics Global Positioning System; Basic principles and applications.

Unit V: Bioterrorism: Definition, Concepts of Biosecurity and microbial forensics, Weapons of mass destruction (WMD), mass-casualty weapons (MCW), Concept of NBC(Nuclear Biological and Chemical) and CBRNE (Chemical, Biological, Radiological, Nuclear, and high yield Explosives), Dirty Bombs.

Practicals

1. To study the Structure of DNA and techniques used in DNA profiling
2. Techniques used in detection of deception
3. Basics of Computer hardware and accessories

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4. Introduction to Operating system and their types
5. Biometrics in Face recognition
6. Individualization of a person from Lip Print
7. Identification of a person by Ridgeology
8. Identification of a person from IRIS and Retina
9. Basic principles and application of Geo-Forensics
10. To study the basics of Environmental Forensics
11. Concept of WMD
12. Study of CBRNE

Suggested Readings:

1. Saferstein: Criminalistics – An Introduction to Forensic Science, Prentice hall Inc. USA 91995).
2. James, S.H. and Nordby, J.J; Forensic Science; an Introduction to Scientific and Investigative Techniques, CRC Press, USA (2003).
3. O' Hara & Osterberg : An Introduction to Criminalistics.
4. Lee, Honry : Advances in Forensic Science.
5. Sharma B R: Forensic Science in Criminal Investigation and trials.
6. Mordby, J Deed Reckoning – The Art of For Forensic Science Detection, CRC Press LLC, Boca Raton FL, CRC Press (2000
7. Jorg T. Epplen Thomas Lubjumhin, DNA Profiling and DNA Fingerprinting; Birkhauser Verlag, Basel, 1995.
8. Leshin, C.B., Internet Investigation in Criminalistics, Prentice Hall, New Jersey, 1997.
9. Tessarolo, A.A. and Marignani, A., Forenisc Science and the Internet. The Canadian Society of Forensic Science Journal, Vol. 29, 1996.
10. Nanda, B.B. and Tewari, R.K. (2001) Forensic Science in India: A vision for the twenty first century Select Publisher, New Delhi.
11. Hess, A.K. and Weiner, I.B. (1999) Handbook of Forensic Psychology 2nd Ed. John wiley & sons.
12. J A Siegel, P.J Saukko (2000) Encyclopaedia of Forensic Sciences Vol. I, II, III, Acad. Press 9
13. Brain Experience – C.R.Mukundan

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MSCFS–402	DC	Scientific Investigation of Crime	60	20	20	30	20	4	1	2	6

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

Unit I:

Physical patterns:

Introduction, Physical patterns in identification, individualization and reconstruction.

Pattern due to blood, Pattern on glass, firearms related patterns, patterns in arson and fires served articles and physical matches, comparison of imprints, indentation, striation, typical presentations, Gait patterns, Bite patterns.

Modus operandi, portrait parley.

Unit II:

Death Investigation:

Cause of death (Natural and Unnatural), Determination of nature of death and general characteristics of suicides, murder and accidents.

Impression of body at scene of crime, inspection of scene of crime. Role of skeletal remains in investigation. Forensic investigation in firearm related cases. Forensic investigation in asphyxia deaths.

Unit III:

Forensic investigation in poisoning cases

Motor Vehicle Investigation: Identification search of physical evidences. Involvement of vehicle in crime, theft investigation. Investigation in hit and run case

Unit IV:

Investigation in offences against properties: Burglary and Robbery investigation in fire, Investigation in Arson Cases.

Unit V:

Investigation in explosive related cases. Investigation in Bank Frauds.

DNA in Police Work: With special reference to role of DNA in sexual offence, disputed paternity, child swapping, identity in dead and living person, civil immigration. Veterinary and wild life and agriculture cases. Legal standards of admissibility of DNA Profiling

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Practicals :

1. To study and examine toolmarks and mechanical fits.
2. To study droplet dynamics of blood on various surfaces and different heights and angles.
3. Reconstruction and evaluation of various scenes of crime.
4. To measure the Gait of Individuals under various circumstances.
5. To study various wear and tear characteristics on footwear.
6. Sweat Analysis of palmer and plantar surfaces.
7. To examine anatomical difference in footprints of individuals. Under various circumstances.

Suggested Readings:

1. B.R. Sharma: Forensic Science in Criminal Investigation and Trials, Universal Law Publishing; Fourth edition 2013.
2. James, S.H and Nordby, J.J.: Forensic Science: An introduction to scientific and investigative techniques 3rd edit. CRC Press, USA.
3. Nanda, B.B. and Tewari, R.K.: Forensic Science in India: A vision for the twenty first century Select Publisher, New Delhi (2001)
4. Richard Saferstein. Criminalistics: An Introduction to Forensic Science. 10th edit Prentice-Hall, New Jersey.
5. Deforest, Gansellen & Lee : Introduction to Criminalistics.
6. Kirk (2000) Vehicular Accident investigation and reconstruction.
7. 3. H. James, Wouldiam G. Eckert (1999) Interpretation of Blood stain evidence at Crime Scene, 2nd edition, CRC Press.
8. N. Gilbert (1993) Criminal Investigation; Third edition, Macmillan Publishing company.
9. Bernard Robertson and G.A. Vignaur (1995) Interpreting evidence John Wiley and Sons Ltd.
10. Kirk (1953) Criminal Investigation Interscience Publisher Inc. New York.
11. B. R. Sharma (1980) Footprints, Tracks and Trials. Central Law Agency. Allahabad.
12. Koblinsky et al. (2005) DNA -Forensic and Legal Implications.

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MSCFS–403	DC	Forensic Toxicology and Pharmacology	60	20	20	30	20	4	1	2	6

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

1. The classifications of poison
2. The extraction and isolation procedure of different types of poison.
3. The analysis different types of poison.
4. The absorption distribution metabolism and elimination of poison

Unit I:

Forensic Toxicology : Introduction, Concept and Significance

Poisons : Definition, classification of poison, Types of poisoning sign and symptoms of poisoning, mode of action, factor modifying the action of poisons, Toxicological exhibits in fatal and survival cases, their preservation

Treatment in cases of poisoning, Analysis report.

Unit II:

Extraction, Isolation and clean- up procedures: Non- Volatile organic poison,

Stas-otto, Dovbriey Nickolls (Ammonium Sulphate) method, acid digest and Valov (Tungstate) methods, solid phases micro extraction techniques, solvent extraction method.

Volatile Poisons : Industrial solvent acid and basic Distillation

Toxic Cations : Dry Ashing and Wet digestion process

Toxic Anion : Dialysis method total alcoholic extract

Unit – III:

General Study and Analysis :Barbiturates, methaqualone, Hydromophine. Methadone, Meprrobamate, Mescaline, Amphetamines, LDS, Heroin, Cannabinoids, Phinothiazines

Insecticides : Types, General methods for their Analysis

Alkaloids : Definition, classification, Isolation, and general characterization.

Unit – IV:

Forensic Examination of Metallic Poisons : Arsenic, Mercury, Lead, Bismuth, Copper, Aluminum, Iron , Barium, Zinc

Analysis if Ethyl Alcohol in blood and urine, illicit liquor, Methanol, Acetone, Chloroform, Phenol

Snake venoms and Poisons, Irrespirable gases

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Unit V:

Forensic Pharmacological studies: Absorption, Distribution, Metabolism, Pathways of drug metabolism

General studies and Analysis of some vegetable poisons, Opium, Abrus, Cynanogenetic glycosides, Dhatura, marking nuts, Nux-vomica, Oleander and Aconite

Practicals :

1. Separation and identification of volatile liquid by simple distillation.
2. Identification of salts and metals by simple colour test and group analysis.
3. Identification of different vegetable poison by colour test, chromatography etc.
4. Identification of insecticides and pesticides by TLC/ colour test.
5. Extraction and identification of drugs/ toxicants from biological matrix and their detection.

Suggested Readings :

1. Stolemen: Progress in Chemical Toxicology: Acad. Press, New York, (1963).
2. Cravey, R.H., Baselt, R.C.: Introduction to Forensic Toxicology, Biochemical publications, Davis C A, (1981).
3. Curry, A.S.: Poison Detection in Human Organs, C. Thomas Springfield, Illinois USA, (1963).
4. Gleason, M.N. et.al: Clinical Toxicology of Commercial products, Williams and Williams, Baltimore, USA, (1969).
5. Sunshine, I.: Guidelines for Analytical Toxicology Programme, Vol. I, CRC Press, USA, (1950).
6. Sunshine: Methods of Analytical Toxicology, CRC Press USA, (1975).
7. Working Procedure Manual – Toxicology, BPR&D Publication, (2000).
8. Saferstein: Forensic Science Handbook, Vols. I, II; (Ed); Prentice Hall, Eglewood Cliffs, NJ; (1988)
9. Modi, Jaishing P.: Textbook of Medical Jurisprudence & Toxicology, M.M. Tripathi Pub., (2001).
10. Parikh C.K. Textbook of Medical Jurisprudence, Forensic Medicines and Toxicology. CBS Pub. New Delhi (1999)
11. Tiwari, S.N.: Analytical Toxicology, Govt. of India Publications, New Delhi, (1987)
12. Clark, E.G.C., Isolation and identification of Drugs, Vol. I and Vol. II, Academic Press, (1986).

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MSCFS–404 (1)	DC	Computer Forensic and Bioinformatics	60	20	20	30	20	3	1	0	4

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

1. The origin and programming of Computer Technology.
2. The role of web technologies in various fields.
3. The classification and legal frame work of cyber space.
4. The classification of Cyber Crime.

Unit I:

Evolution of Computer Technology & Cyberspace:

History of Digital Computer, Generation of Computers, Basics of Computer, Recent Trends in **Computer Technology Computer Programming:** Programming Cycle, Basics of Programming, Interpreter, and Compiler, Various programming languages and their special features, Programming in C, Object Oriented Programming, Java programming, JSP and Servlet. **Internet & Web Technologies:** Role of Networking in IT, Evolution and Impact of Internet, Internet Services, Internet Process Concept of World Wide Web, History of World Wide Web, Purpose of Web, Functioning & Mechanism of Web, Web Hosting & Development, Website Legal Issues HTML (Elements, Attributes, Headings, Paragraphs, Formatting, Fonts, Styles, Links, Images, Tables, Lists, Forms, Frames, Iframes, Colors, Colornames, Colorvalues, Layout, Doctypes, CSS, Head, Meta ,Scripts, Entities, URLs, URL Encode, Webserver) XML, PHP, Installing PHP on wamp server PHP(Syntax, Variables, String, Operators, If...Else, Switch, Arrays, While Loops, For Loops, Functions, ,forms, GET, POST, Date, Include, PHP File, File Upload, Cookies, Sessions, E-mail, Secure E-mail, Error, Exception Filter)

Cyberspace:

Concept of Cyberspace, Emergence of Cyberspace, Nature & Meaning of Cyberspace, Attributes of Cyberspace, Classification of Cyberspace, Legal Framework for Cyberspace.

Unit II:

Image Processing: Image Processing Fundamentals, Digital Image Processing and Computer Graphics Understanding Digital Image Processing, Origins of Digital Image Processing, Examples of fields that Use Digital Image Processing, Steps in Digital Image Processing, Components of an image Processing System.

Image File Forensic: Understanding various image formats (Vector and Raster), and File Compression, Locating and recovering image files. Various Image

Enhancement Techniques: Image Enhancement in the Spatial Domain (Gray level transformations, Histogram processing, Arithmetic and logic operations, Spatial filtering: Smoothing and sharpening filters) Image Enhancement in the Frequency Domain (Frequency domain filters: Smoothing and Sharpening filters Homomorphic filtering)

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Unit III: Wireless Networks and Internet Forensics:

Wireless Networks: Wireless Infrastructure, Difference between wired and wireless networks. Wireless Transmission, Telecommunication Systems

Wireless LAN: IEEE 802.11 (Architecture Physical Layer MAC Layer Addressing mechanism) Cellular Telephony: Frequency reuse principal, Transmitting- Receiving Handoff roaming, First Second and Third Generation. Satellite Networks: Orbits, Footprints, three categories of satellites (GEO, MEO, LEO)

Unit IV: Internet Forensic:

Obfuscation: Anatomy of URLS, IP Addresses in URLS, Usernames in URLS, Encoding the Entire Message, Similar Domain Names, Making a form look like a URL, Bait and Switch-URL Redirection, JavaScript, Browsers and Obfuscation

Websites:

Capturing Web Pages, Viewing HTML Source, Comparing Pages, Non-Interactive Downloads Using wget, Mapping out the entire website, Hidden Directories, In Depth Example- Directory Listing, Dynamic WebPages, Filling Out Forms, In depth Example-Server side Database, Opening the Black Box.

Web Servers: Viewing HTTP Headers, Understanding Header Information, Cookies, Redirection, Web Server Statistics, Controlling HTTP Headers.

Unit V: Cyber crimes and related offences and penalties.

Introduction to Cybercrimes, Classification of cybercrimes., Distinction between cyber crime and conventional crimes, Reasons for commission of cyber crime

Kinds of cyber crimes: cyber stalking; cyber pornography; forgery and fraud; crime related to IPRs; Cyber terrorism; Spamming, Phishing, Privacy and National Security in Cyberspace, Cyber Defamation and hate speech, computer vandalism etc.

Relevant provisions under Information Technology Act, 2000, Indian Penal Code, 1860.]

Suggested Readings:

1. Balguruswami, Programming with C
2. Balguruswami, Programming with JAVA
3. Michael Morrison, Faster Samrter HTML & XML, Microsoft Press
4. William McCarty, PHP 4: A Beginers Guide, McGraw Hill
5. Gonzalez & Woods, Digital Image Processing, Pearson Education Publication
6. Tinku Acharya and Ajay K Ray, Image Processing Principal and Application, Wiley Publication
7. Computer Forensic Investigating Data and Image Files, EC Council Press
8. Forouzan Data Communication and Networking McGraw Hill
9. Jochen Schiller Mobile Communication Addison Wisely Pearson Eduction
10. Robert Jones, Internet Forensics Using Digital Evidence to Solve Computer Crimes,
11. O'Reilly Media Publication.
12. John R. Vacca, Network and System Security, Syngrees Publication
13. Stallings, "Cryptography And Network Security: Principles and practice"
14. C. P. Pfleeger, and S. L. Pfleeger, "Security in Computing", Pearson Education.
15. Matt Bishop, "Computer Security: Art and Science", Pearson Education.
16. Kevin Mandia, Chris Prosise and Matt Pepe, Incident response and computer forensics. McGraw Hill Publication

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			End Sem University Exam	Two Term Exam	Teachers Assessment*	End Sem University Exam	Teachers Assessment*				
MSCFS–404 (2)	DC	.Forensic computing & offences	60	20	20	30	20	3	1	0	4

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

1. The cyber crime investigation
2. Recent advancement in IT act.
3. The network security.

Unit I:

Cyber Crime Investigations: Where Evidence Resides on Windows systems, Conducting a Windows investigation, File Auditing and Theft of information, handling the depating Employee, Steps in a Unix Investigation.Reviewing Pertinent Logs, Performing Keywords Searches, Reviewing Relevant Files, Identifying Unauthorized User Accounts or Groups, Identifying Rogue Processes, Checking for Unauthorized Access Points, Analyzing Trust Relationships, Detecting Trojan Loadable Kernel Models. Finding Network based Evidence, Generating Session data with TCP Trace, Reassembling sessions using TCP flow and Ethereal.

Unit II:

Recent amendments in IT Act, 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., Encryption and Decryption methods. Search and seizures of evidence. Investigation of cyber crimes and tools for analysis.

Unit III:

Network Security: 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.

Unit IV:

Bioinformatics & its Applications : Public domain databases for nucleic acid and sequences (EMBL, Gene Bank), database for protein structure (PDB) , Bioinformatics for microbial detection and forensic diagnostic design (1): Whole genome analysis, analyses for repeats (Direct and inverted); palindromes, open reading frames, annotation of genes, identification of gene.

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Unit V:

Overview of comparative genomics, Computational methods, homology algorithms (BLAST, FASTA) for proteins and nucleic acid, Oligonucleotide probe synthesis, artificial gene synthesis, primer and probe designing , CODIS and NDIS, phylogenetic analysis

Suggested Readings:

1. Advances in digital forensic VI by kam pui chow, sujeet shenoi
2. Malware forensic by Cameron malin
3. Windows registry forensic by Harlan carvey,
4. Digital forensic for network internet and cloud computing clint garrison
5. Wireless crime and forensic investigation by Gregory kipper
6. Digital image forensic by husrev taha, nasir memon
7. Computer forensic in. Advances in digital forensic VI by kam pui chow, sujeet shenoi
8. Malware forensic by Cameron malin
9. Windows registry forensic by Harlan carvey,
10. Digital forensic for network internet and cloud computing clint garrison
11. Wireless crime and forensic investigation by Gregory kipper.
12. Digital image forensic by husrev taha, nasir memon.
13. Computer forensic investigating data and image files by Ec-council
14. Network forensic tracking hackers by sherri Davidoff
15. Mastering windows network forensic by steven anson
16. Anti computer forensic by Gred numitor
17. Computer forensic Nathan Clarkevestigating data and image files by Ec-council

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MSCFS–404 (3)	DC	Wild Life Forensic	60	20	20	30	20	3	1	0	4

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

1. The significance of wildlife forensics .
2. Significance of environmental forensics.
3. Legal act related to wild life and environment forensics.

Unit I:

Wildlife Forensic: Protected and endangered species of animals and plants; Sanctuaries and their importance; Relevant provision of wild life and environmental act; Types of wildlife crimes, different methods of killing and poaching of wildlife animals; Enforcement of wildlife protection policy, Wild animals as pharmacopeias, Wildlife artifacts(Bones, skin, fur , hair, nails, blood, feather, etc.), Trade in wild animals, elephant-, Indian rhino, wild cat, poisonous snakes for venom and skin, crocodiles, salamanders, deer, birds (feathers Macau parakeets, whales, sharks, spectacle bear, Himalayan antelopes. Recovering evidence at poaching scenes, Locating the burial: Anomalies on the surface international trade in reptile skins, Challenges to species identification of reptile skin products, species and products represented in the reptile skin trade, reptile scale morphology basics and current limitations, Identifying features of major reptile groups. Wildlife (Protection) Act-1972 .

Unit II:

Environmental Forensics: Introduction to Environmental Forensics. Mercury- Natural and anthropogenic sources, detecting mercury in indoor environment and forensic aspects. Asbestos- sources and detection in air, water, fibres etc. Sewage, Lead- sources, compounds, analytical methods and lead forensics. Arsenic- sources, compounds, analytical methods and forensic aspects. Pesticides- Types, analytical testing and forensic techniques. Polycyclic aromatic hydrocarbons (PAHS)- sources, types and analytical techniques. Crude oil and refined products- oil analysis methods, oil spill analysis protocol

Unit III:

Environment and Ecosystems: Ecosystem characteristics structure and function; environmental pollution , xenobiotic and recalcitrance, Introduction to BOD and COD, use of biosensors to determine the quality of environment, Introduction and scope of environmental management, basic concepts of sustainable development, Environmental Impact Assessment (EIA),

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general guidelines for the preparation of environmental impact statement (EIS), international organization for standardization (ISO),

Unit IV:

Environmental Legislation: central and state boards for the prevention and control of environmental pollution, powers and functions of pollution control boards, penalties and procedure, duties and responsibilities of citizens for environmental protection.

Unit V:

The Water (Prevention and Control of Pollution) Act 1974. Prevention and Control of Air Pollution Act 1981, Forest Conservation Act 1981, Environment (protection) Act 1986, Hazardous waste (Management and Handling) Rules, 1989, Bio-Medical Waste (Management and Handling) Rules, 1998. Issues involved in enforcement of environmental legislation, public awareness, and public interest litigations (PILs) and its role in control of environmental pollution in India.

Suggested Reading:

1. Forensic science in wild life investigation, Linarce, Adrian CRC Press, Taylor & Francis
2. The wild life (protection) act, Baalu, T.R.1972, Nataraj Publication
3. Wild life (Protection act, 1972), Universal Publication
4. Wildlife protection act, 1972; Natraj Publishers
5. Instrumental Methods of Analysis6th Edition. (1986): H.H. Willard, L.L. Merritt Jr. and others.CBS Publishers and Distributors.
6. Instrumental Methods of Chemical Analysis. (1989):Chatwal G and Anand, S.Himalaya Publishing House, Mumbai.
7. A Biologists Guide to Principles and Techniques of Practical Biochemistry. (1975): Williams, B.L. and Wilson, K.

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MSCFS–405	DC	Dissertation	-	-		100	50	3	1	0	6

Dissertation

Every student will carry out dissertation under the supervision of Supervisor/(s) (Internal/External). The topic shall be approved by a Committee constituted by the Head of the concerned Institute. Every student will be required to present two seminar talks, first at the beginning of the Dissertation (Phase-I) to present the scope of the work and to finalize the topic, and second towards the end of the semester, presenting the work carried out by him/her in the semester.

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