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Establishment of Forensic Engineering Branch in Technical Institution in India

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Abstract:- This paper will indicate how to establish forensic engineering courses in India.This course will overview the engineering techniques of past, present and future. It will also provide students with a broad background on forensic engineering along with the knowledge of additional information sources to investigate issues in their professional careers.

Keywords —**Establishment of Forensic Engineering, Approval & Affiliation Required, Syllabus, Workshop Practice, Faculty,Internship Program, Placements.**

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I. INTRODUCTION

In India there is lack of education and opportunity in the field of Forensic Engineering. It is because of problems like shortage of staff, lack of interest and motivation amongst teachers, an insensitive attitude of the education department, lack of proper infrastructure and funds.Lack of funds that further creates a lack of books, workshop materials & learning materials. Instead of focusing on outdated models of brick and mortar colleges and universities, they need to create educational delivery mechanisms that can really take the wealth of human knowledge to the mass.

The advantage of this subject is, it is applied most commonly in civil law cases, although may be of use in criminal law cases. It is essentially a failure analysis program for litigation support. Given Below will help us to understand the importance of this course for analysis failures in different form. (Fig 1.1)

S n	Fire & Explosive Analysis	Water Loss Analysis	Failure Analysis	Accident Investigations
1	Resident & Commercial Structure	Acetyl & Other Polymer Failure	Metallurgy	Automotive Electronic control systems
2	Vehicle & Heavy Equipment	Dezincification	Medical Implant Failures	Crash Data Recorder Analysis
3	Lightning Fire	Galvanic Analysis & Testing	Boiler & Pressure Vessel Failures	Volatile Materials Explosion Accidents
4	Motorhome Fire & Explosions	Fracture Surface Analysis	Aerospace Component Failures	Equipment Controller Defect Analysis
5	Electrical Wiring Defects	Plumbing Component Finite Element Stress Modelling	Manufacturing & Defect Assembly	Code Research

6	Boiler Equipment Fires	Polymer UV Exposure Failure	Electrical Arcing Metallurgy	Forklift Accidents
7	Gas Control valves & Leakage	Stress Corrosion Cracking	Heat Inducted Oxidation	Scissor Lift Accidents
8	Transformer Explosion	Erosion Corrosion	Engine Component Failures	Marine Propulsion Accidents
9	Solar Panel Fire	Pipe Coupling Failures	Cable & Rope Failures	Friction Testing
10	Carbon Monoxide Poisoning Analysis & Testing	Chlorine/Chemical Attack	Finite Element Impact & Dynamic Loading Modelling	Accidents Reconstruction

(Fig 1.1)

II. APPROVAL&AFFILIATION REQUIRED.

- **Ministry of Human Resource Development, (MHRD) Government of India -** The Ministry of Human Resource Development (MHRD) is under Government of India, responsible for the development of human resources. It was created on September 26, 1985, through the 174th amendment to the Government of India (Allocation of Business) Rules, 1961.MHRD is currently working through two departments:
  1. Department of School Education & Literacy.
  2. Department of Higher Education.

- **University Grants Commission, (UGC) Government of India** - The University Grants Commission of India is a statutory body set up by the Indian Union government in accordance to the UGC Act 1956 under Ministry of Human Resource Development, and is charged with coordination, determination and maintenance of standards of higher education. It provides recognition to universities in India, and disburses funds

to such recognised universities and colleges.

- **All India Council for Technical Education (AICTE) -**The All India Council for Technical Education (AICTE) is the statutory body and a nationallevel council for technical education, under Department of Higher Education, Ministry of Human Resource Development.AICTE is responsible for proper planning and coordinated development of the technical education and management education system in India.Therefore for an engineering and management, Institute must be recognised by UGC and the course from AICTE, approval from both the bodies is essential to have valid degree & certifications.

- **Ministry of Home Affairs, (MHA) Government of India -** Perspective plan for Indian Forensics was been presented to the Ministry of Home Affairs (MHA), Government of India on July 2010.Further 499 addressees representing direct & indirect forensic promoters and beneficiaries a letter of hardcopy & softcopy was sent. These addressees included

  1. Directorate of Forensic Science (DFS), MHA
  2. Director of Central Forensic Laboratories (CFSLs) Under Directorate of Forensic Science (DFS) & Central Bureau of Investigation (CBI)
  3. Directors of State/Union Territories Forensic Science Laboratories (FSLs)
  4. Forensic Medicine Expert & Police Surgeon's
  5. Officers of Central Bureau of Investigation (CBI), National Security Guard (NSG), Narcotic Control Bureau (NCB), Central Industrial Security Force (CISF),

& Indo Tibetan Border Police (ITBP)
6. Deputy Controllers of Explosives
7. Officers of Defence Service
8. Principals of Central Detective Training Schools
9. Directors National Institute of Criminology & Forensic Science (NICFS), MHA
10. Heads of Academia (Universities/Collages/Institute) offering forensic science courses.

- **State Government Technical Board-**The state government technicalBoardwhich are been established by the passing oflegislation by a state government. It is an educational institute established by the state government and also funded by it. Most of the technical as well as management courses are conducted by the affiliation by the state government technical board. It is alsobeen governed by the guidelines laid down by the UGC& AICTE.

III. SYLLABUS

- Introduction
- Wind Damage to Residential Structure
- Lightning Damage to Well Pumps
- Evaluating Blasting Damage
- Building Collapse Due to Roof Leakage
- Putting Machines & People Together
- Determining the Point of a Fire
- Electrical Shorting
- Explosions
- Determining the Point of Ignition of an Explosion
- Arson and Incendiary Fires
- Simple Skids
- Simple Vehicular Falls
- Vehicle Performance
- Momentum Methods
- Energy Methods
- Curves and Turns
- Visual Perception and Motorcycle Accidents

- Interpreting Lamp Filament Damages
- Automotive Fires
- Indian Evidence Act, (1872)
- The Information Technology Act, (2000), Cyber Law
- Indian Penal Code
- Code of Criminal Procedure
- Case Study

IV. WORKSHOP PRACTICE.

This is most important part of Technical Education, in order to gain good knowledge in the field of forensic engineering, students entering the degree should undergo a course on workshop practices which will help them to understand the construction, function, and the use of equipment's as well as techniques for failure analysis & Accidental Investigations. Besides above, development, safety, precision, team work are the above objectives.

List below are some of the instruments that can be used to set up a workshop for Forensic Engineering practices

1. Carbon Membrane - It extract ignitable vapour from fired debris& best for thermal stability & chemical resistance. (Fig 1.2)
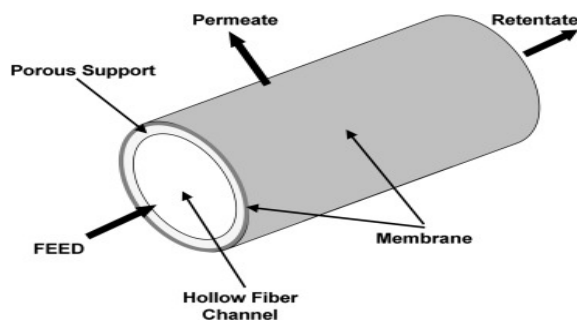
(Fig 1.2)

2. Gas Chromatography with Mass Spectral Detector Instrument for fire debris analysis - It is been used to separate and analyse compounds that can be vaporized without decomposition. (Fig 1.3)

(Fig 1.3)

3. Infrared and Raman Spectrometry for Explosive and Unknown Chemical analysis - It provides information on molecular vibrations, both vibrational techniques involve changes in vibrational energy level through interactions of the molecular chromophore with electromagnetic radiations. (Fig 1.4

(Fig 1.4)

4. Scanning Electron Microscope - It produces images of sample by scanning with a focused beam of electrons, the electrons are therefore interacted with atoms in the sample, producing various signals containing information about the surface topography and composition of the samples. (Fig 1.5)

(Fig 1.5)

5. Real Time X- ray - It is used as the inspection of test subject using x-ray technology while the subject is in form of motion. (Fig 1.6)

(Fig 1.6)

V. FACULTY

Faculty for forensic engineering can be hired from field of engineering, Law professionals, below are some of the examples which can be implemented at the time of recruitment of faculty in this course.

1. Civil Engineers for structural engineering
2. Mechanical Engineers for failure programs in applied mechanics
3. Industrial Safety Engineers for Industrial Accidents
4. Electrical Engineer for Electric Shorting and Lightning Damage.
5. Advocates for Civil, Criminal &Basic Bare Acts.

VI.   INTERNSHIP

Internship is very important part of technical education. It indicates the Real-world working skills for an Industry which is a great opportunity for a engineering students to learn to use their education for more practical purpose. Forensic Engineers can take internship fromsome of the industries like: -

1. Indian Railways (Collision, Train Marooned, Derailment, Tunnel Collapse, Fire Explosion in Train)
2. Director General of Civil Aviation (Mid Air Collision, Defective Runways, Mechanical Failure, air traffic control error)
3. Directorate General of Shipping (Offshore Oil Rig Mishaps, Accidents on Crude Oil Tankers, Cruise, Tugboats & Cargo ships, Grounding of Ships, Crane Mishaps, Cargo Hauling Accidents)
4. National Disaster Management Authority (Industrial Safety Security, Emergency & Crisis Management, Risk Assessment & Safety Audits,)

VII.   PLACEMENTS

Forensic Engineer's can get placed in both private and public sector, followings are some of the examples where they can be placed: -

1. Central Bureau of Investigation
2. Criminal Investigation Department
3. Police
4. Intelligence Bureau
5. Indian Army
6. Indian Airforce
7. Indian Navy
8. Defense Research & Development Organization
9. Indian Space Research Organisation
10. Forensic Laboratory
11. Insurance Companies
12. Private Detective Agencies
13. Universities
14. Public & Private Industries

VIII.   CONCLUSION

This paper indicates the briefing required to set up Forensic Engineering branch   in private & public technical institution in India.

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