UNIVERSITY OF DELHI

CNC-II/093/1/EC-1275/2025/19
Dated: 29.07.2025

NOTIFICATION

Sub: Amendment to Ordinance V

(ECR 07-14/ dated 23.05.2025)

Following addition be made to Appendix-II-A to the Ordinance V (2-A) of the Ordinances of the University;

Add the following:

The syllabi of the following Skill Enhancement Courses (SEC) to be added in the Pool of Skill Enhancement Courses offered to the Undergraduate Students in the University, based on Undergraduate Curriculum Framework 2022 are notified herewith for the information of all concerned:

1. Electronics Domain
   (a) Robotics and Automation - Annexure-1
   (b) Introduction to IoT using Arduino - Annexure-2

2. Computer Science Domain
   (a) Low-Code/No-Code Development - Annexure-3

3. Life Sciences Domain
   Biomedical Sciences Subdomain
   (a) Forensic Analysis of Biological Evidence
   (b) Forensic Toxicology
   (c) Questioned Document Examination
   (d) Injury and Death

   } Annexure-4

REGISTRAR

Robotics and Automation

CREDIT DISTRIBUTION, ELIGIBILITY AND PRE-REQUISITES OF THE COURSE

Course title and Code	Credits	Credit distribution of the course			Eligibility Criteria	Prerequisite of the Course (if any)
		Lecture	Tutorial	Practical/Practice		
Robotics and Automation	2	0	0	2	Class XII	Any Programming Language

1. Learning Objectives

After completion of this course students would be aware of Robotics and the concept of using a microcontroller to program the Robot. They would be able to use various sensors and make microcontroller respond to the external environment. Student would be in a position to make rudimentary robot which is capable of moving along a predetermined path, follow a drawn line and equivalent applications. They would be able to make a robotic arm capable of Picking and Placing the objects.

2. Learning Outcomes

At the end of this course, Students will be able to

1. Understand the basic Components used in robotics in various industries.
2. Understand the hardware platforms and their programming environments used in robotics applications.
3. Understand the working of sensors, actuators and other components used in design and Implementation of robotics
4. Develop a moving robot and robotic arm.

3. Main Course Structure

Unit I

Introduction to Robotics: Defining Robotics, Laws of Robotics, History of Robotics, different types of robots, Components of Robot, Applications of Robotics in Health care, Automobile industry and Domestic, and logistics.

Unit II

Hardware and Programming Platforms of Robotics: Microcontrollers, Arduino, Raspberry Pi etc, Programming Environments Integrated Development Environment (IDE)

Unit III

Sensors, Actuators and Grippers: PIR sensors, Sound Sensors, Vision Sensor, Gyroscope and Accelerometer, Magnetometer etc, Actuators like DC Motors, Servo Motors, Stepper motors, Motor Control, Grippers

Unit IV

Robotic Arms/ Manipulators: Understanding Manipulator Kinematics, Joints and Links, Type of Joints, Degree of Freedom, Manipulator dynamics.

PRACTICALS

1. Programming the hardware platform with sensor and record the values for different environments on serial monitor.
2. Programming the hardware platform with Actuators and visualize the motion produced.
3. Programming the hardware platform with indictors like LCD, LED, Buzzers.
4. Construct a simple Line following Robot.
5. Construct a line following robot with Obstacle Detection and Indicating the presence of obstacle.
6. Designing a simple Robotic Arm and programming it for picking and placing of objects

4. Teaching Methodology/Activities in the classroom

1. Depiction of usage of robotics in Health care and Automobile industry through Videos.
2. Grouping of Interdisciplinary students for one project since robotics is itself an interdisciplinary field with knowledge required from mechanical, electronics and well as computer science domains.
3. Hands on practical session
4. Visit to an industry to visualize the implementation of robotics in India.

5. Assessment Pattern for each Unit/practical. Component of Attendance in the Assessment of 1 credit theory course

S. No.	Assessment Method	Marks
1	Quiz	10

2	Presentation on recent advancements/ Future / Challenges of robotics in India	10
3	Practical Completion	50
4	Extra Project Implementation	10
	TOTAL	**80**

6. Mapping with the next suggestive course

Advanced Robotics for automation

IoT and its application

7. Prospective Job Roles after a particular course

Robotic engineer

Robot Operator

Robotics Programmer

Mechatronics Engineer

8. Essential Reading

1. Saha, S.K., Introduction to Robotics, 2nd Edition, McGraw-Hill Education, New Delhi, 2014
2. R.K. Mittal, I.J. Nagrath, —Robotics & Control, Tata McGraw & Hills, 2005.

9. Suggestive Reading

1) Robotic Engineering – An Integrated Approach by Richard D Klafter, Thomas A. Chmielewski and Michael Negin, Prentice Hall India (1989)
2) Saeed B. Niku, Introduction to Robotics, Analysis, systems and Applications, PHI (2007)

Introduction to IoT using Arduino

CREDIT DISTRIBUTION, ELIGIBILITY AND PRE-REQUISITES OF THE COURSE

Course title and Code	Credits	Credit distribution of the course			Eligibility Criteria	Prerequisite of the Course (if any)
		Lecture	Tutorial	Practical/ Practice		
Introduction to IoT using Arduino	2	0	0	2	XII pass	Basic Knowledge of any Programming Language

1. Learning Objectives

- To introduce students to the fundamentals of the Internet of Things (IoT).
- To enable hands-on experience with Arduino.
- To develop basic to advanced IoT applications using sensors, actuators, and cloud platforms.

2. Learning Outcomes

By the end of the course, students will:

- Understand IoT fundamentals and Arduino programming.
- Interface various sensors and actuators for IoT applications.
- Develop real-world IoT solutions with cloud integration.
- Implement IoT projects.

3. Main Course Structure

Unit 1: Introduction to IoT & Arduino (Weeks 1-4) **[16 Hours]**

Introduction to IoT and Arduino: Basics of IoT, its components, and real-world applications. Introduction to Arduino board (Uno/Nano). Overview of Arduino IDE and basic coding structure.

Interfacing Basic Components: Understanding Digital and Analog I/O. Hands-on with LEDs, Buzzers, and Switches using Arduino. Introduction to Serial Communication (UART, SPI, I2C).

Unit 2: Working with Sensors & Actuators (Weeks 5-8) **[16 Hours]**

Analog & Digital Sensors: Difference between Analog and Digital Sensors, Sensor Characteristics. Various kinds of sensors for different IoT applications: LM35, DHT11 sensor for Temperature and Humidity; Light Sensor (LDR) for detection of light intensity; InfraRed Sensor (IR) for Motion and object detection; Ultrasonic Sensor for

distance measurement; Gas Sensor MQ-135 for air quality; Accelerometer and Gyroscope, magnetometer Sensors. Displaying sensor data on Serial Monitor and on Interfaced LCD screen/TFT screen.

Actuators: Motors like DC, Servo, Stepper to create motion. Relays to Control switching on/off of Electrical Appliances.

Unit 3: IoT Communication & Cloud Integration (Weeks 9-12) [16 Hours]

Introduction to Wireless Communication (Wi-Fi & Bluetooth): Introduction to Wi-Fi, Bluetooth, and MQTT Protocols. Basics of ESP8266 Wi-Fi Module and HC-05 Bluetooth Module. Sending simple data over Bluetooth and Wi-Fi.

IoT Cloud Platforms & Data Storage: Introduction to cloud platforms for IoT applications. Sending Sensor Data to the Cloud Dashboard.

Remote Monitoring & Control: Retrieving sensor data from the Cloud Dashboard. Controlling Arduino remotely using Mobile App.

Unit 4: Hands-on IoT Mini Project and Presentations (Week 13-15) [12 Hours]

Demo of Arduino-Based Mini Projects by Students (including but not limited to):

- Motion-Based Security Alarm
- IoT-Based Weather Station
- Bluetooth-Controlled Home Automation
- Ultrasonic-Based Smart Parking System
- IoT-Based Intruder Alert System
- Smart Dustbin
- Heart Rate Monitor using Pulse Sensor
- IoT-Based Fire Detection System

Practical List:

Study the Arduino board and install Arduino IDE and configure it for Arduino Uno/ Nano. Perform the following experiments on Arduino board:

P1. Write a program to blink an LED with an interval of one second.

P2. Write a program to continuously create a fading effect in an LED using PWM (Pulse Width Modulation).

P3. Write a program to turn the LED ON when the button is pressed and OFF when released.

P4. Write a program to activate the buzzer when the button is pressed.

P5. Write a program to read analog sensor values of LDR and display them on the serial monitor/ LCD.

P6. Write a program to measure the light intensity with LDR and turn an LED ON/OFF based on threshold.

P7. Write a program to read the temperature values using analog sensor LM35, calculate the temperature in Celsius and Fahrenheit and display on serial monitor/ LCD.

P8. Write a program to read the values of ultrasonic sensor, calculate the distance to an object and display the distance on serial monitor/ LCD.

P9. Write a program to read the values from a smoke sensor, calculate the gas concentration in parts per million (PPM), and display the reading along with "Safe" or "Unsafe" messages based on the threshold, on the serial monitor/ LCD.

P10. Write a program to read the values from accelerometer, gyroscope, and magnetometer modules and display the values on serial monitor/ LCD.

P11. Write a program to read the values of temperature and humidity using digital sensor DHT11 and display the values on serial monitor/ LCD.

P12. Write a program to interface a DC Motor with a motor driver (L293D) to control its rotation direction (clockwise/anticlockwise) with button presses.

P13. Write a program to interface a DC Motor with a motor driver (L293D) to control the speed of motor using Pulse Width Modulation (PWM).

P14. Write a program to interface a servo motor with Arduino and rotate it to specific angles: 0°, 90°, and 180°.

P15. Write a program to interface a relay module with Arduino to control the turning ON and OFF of a 220V bulb when an LDR detects darkness/ brightness.

P16. Write a program to simulate a traffic light sequence (Red → Green → Yellow) using LEDs.

P17. Write a program to interface a Bluetooth module HC-05 with Arduino and send "1"/"0" commands from the mobile phone to control an LED ON/ OFF.

P18. Write a program to interface a Bluetooth module HC-05 with Arduino and send any sensor data (e.g., temperature, light intensity) from Arduino to mobile phone.

P19. Write a program to connect ESP8266 Wi-Fi module to Arduino. Send temperature and humidity data from DHT11 or any other sensor data, to and from a cloud dashboard. Monitor live sensor data on a cloud dashboard.

4. Teaching Methodology/Activities in the classroom: After completion of each unit student will be engaged in the hands-on activity involving the IoT concept taught. The use cases pertaining to industry will be discussed.
5. Assessment Pattern for each Unit/practical. Component of Attendance in the Assessment of 1 credit theory course: As per University guidelines for SEC courses.
6. Mapping with the next suggestive course: After their confluence with IoT course they can be engaged in exploring more IoT microcontrollers. Next suggestive course can be framed on Advanced IoT using Raspberry Pi.
7. Prospective Job Roles after a particular course: Students with relevant skill sets in IoT tools with job opportunities in roles such as IoT Developer – Designing and implementing IoT applications, Embedded Systems Engineer – Working with microcontrollers and IoT hardware, Cloud IoT Engineer – Managing IoT data on cloud platforms, Automation Engineer – Implementing smart automation solutions using IoT etc.
8. Essential Readings:

- "Introduction to IoT" Sudip Misra, Anandarup Mukherjee, and Arijit Roy. Cambridge University Press
- "Arduino Cookbook: Recipes to Begin, Expand, and Enhance Your Projects" by Michael Margolis, Brian Jepson, and Nicholas Robert Weldin. O'Reilly Books

9. Suggestive Reading:
   - "The Internet of Things" by Samuel Greengard. The MIT Press
   - www.arduino.cc
   - www.thingsboard.io

Low-Code/No-Code Development

CREDIT DISTRIBUTION, ELIGIBILITY AND PRE-REQUISITES OF THE COURSE

Course title and Code	Credits	Credit distribution of the course			Eligibility Criteria	Prerequisite of the Course (if any)
		Lecture	Tutorial	Practical/Practice		
Low-Code/ No-Code Development	2	0	0	2	Class XII	NA

Learning Objectives

The learning objectives of this course are as follows:

- To understand the fundamental of low-code/no-code platforms
- Can develop Web & Mobile Apps using modern drag-and-drop platforms like Bubble.io, Adalo, Webflow, etc.
- Can automate workflows and integrate third-party services like Firebase Authentication, Airtable, OpenAI API, Stripe, Twilio, Google Maps API, etc.

Learning Outcomes

The learning outcomes of this course are as follows:

- Students can build various Web & Mobile applications with very less or no programming knowledge.
- Students can work with modern drag-and-drop tools like Bubble.io, Adalo, and Webflow.
- Students can deploy low-code/no-code applications on cloud platforms.

Main Course Structure

Unit 1: Introduction to Low-Code/No-Code Development (8 Hours)

- Overview of Low-Code and No-Code platforms.
- Understanding when to use Low-Code/No-Code solutions.
- Introduction to platforms like Bubble.io, Webflow, and Adalo, etc.

Unit 2: Building Web and Mobile Apps with Drag-and-Drop Tools (12 Hours)

- UI/UX Design principles for no-code platforms.
- Developing interactive web pages with Webflow and Bubble.
- Creating mobile apps using Adalo and Glide.

Unit 3: Automating Business Workflows (12 Hours)

- Introduction to workflow automation tools.

- Using Zapier and Make (Integromat) to connect services.
- Automating processes with Google Apps Script and n8n.

Unit 4: Integrating APIs and External Services (12 Hours)

- Connecting external APIs without coding.
- Using OpenAI API for AI-based features.
- Payment gateway integration using Stripe or Razorpay.

Unit 5: Deploying and Managing No-Code Applications (16 Hours)

- Hosting and publishing applications on various platforms.
- Security considerations in no-code applications.
- Scaling low-code solutions for enterprise needs.

Practical List:

1. **Building a Basic Web Page**: Create a simple landing page using Webflow.
2. **Developing a Mobile App**: Build a to-do list or note-taking app using Adalo or Glide.
3. **Automating Workflows**: Automate email responses using Zapier and Google Sheets.
4. **Connecting a Database:** Use Airtable as a backend for a no-code web app.
5. **Integrating AI in a No-Code App**: Use OpenAI API to add chatbot functionality to a Bubble app.
6. **E-commerce Payment Integration**: Implement Stripe or Razorpay in a no-code online store.
7. **Deploying a No-Code App**: Publish a no-code app on Firebase or a custom domain.

Project Guidelines

Students will develop a **fully functional no-code/low-code application** of their choice, following structured milestones. Example projects include:

- **Business Website or Portfolio Site** (Webflow/Bubble)
- **Task Management or To-Do App** (Adalo/Glide)
- **AI-Powered Chatbot for Customer Support** (Bubble + OpenAI API)
- **E-Commerce App with Payment Gateway** (Adalo + Stripe)
- **Automated Email Responder or CRM System** (Zapier + Google Sheets)
- **Job Listing or Hiring Platform** (Airtable + Webflow)
- **Inventory Management Dashboard** (Airtable + Make)
- **AI-Powered Image Recognition App** (Bubble + Google Vision API)

1. Teaching Methodology/Activities in the classroom

Teach students to utilize various drag-and-drop tools for developing various no-code applications via hands-on sessions and group project.

2. Assessment Pattern for each Unit/practical. Component of Attendance in the Assessment of 1 credit theory course

S.No.		Component	Marks
1		Evaluation using practical list given in syllabus	30
2		Evaluation of quizzes conducted during semester	20
3.		Project to be developed during semester	
	A	Milestone 1: Designing the App Layout and Wireframe	5
	B	Milestone 2: Implementing Functionalities with No-Code Tools	10
	C	Milestone 3: Integrating Third-Party Services & Automations	10
	D	Milestone 4: Deployment & Final Presentation	5
Total			80

3. Mapping with the next suggestive course
   - AI-Powered Web Applications (Proposed)

4. Prospective Job Roles after a particular course

   - No-Code Developer
   - Automation Specialist
   - Product Manager

5. Essential Reading
   - Adkin, D. (2022). The No-Code Playbook: Build Scalable Software Without Coding. Adalo.
   - Bubble manual and documentation. Retrieved from https://manual.bubble.io
   - Webflow university documentation. Retrieved from https://university.webflow.com
   - Zapier help & documentation. Retrieved from https://zapier.com/help

6. Suggestive Reading
   - Ries, E. (2011). *The Lean Startup: How Today's Entrepreneurs Use Continuous Innovation to Create Radically Successful Businesses*. Crown Business.
   - *Integromat user guide and API documentation*. Retrieved from https://www.make.com/en/help
   - *OpenAI API documentation*. Retrieved from https://platform.openai.com/docs
   - *Stripe developer documentation*. Retrieved from https://stripe.com/docs
   - *Google Apps Script developer guide*. Retrieved from https://developers.google.com/apps-script

SKILL ENHANCEMENT ELECTIVE (SEC) COURSES

Forensic Science Series

Already Existing and Approved Courses

1. Basic Forensic Science
2. Forensic Chemistry

Proposed Courses

1. Forensic Analysis of Biological Evidence (**Proposed by Dept of Biochemistry and Acharya Narendra Dev College**)
2. Forensic Toxicology (**Proposed by Acharya Narendra Dev College**)
3. Injury and Death (**Proposed by Acharya Narendra Dev College**)
4. Questioned Document Examination (**Proposed by Acharya Narendra Dev College**)

Skill development and job opportunities

- After completion of this course students would obtain the training in collection, documentation, and analysis of physical evidences. They will be encouraged to do short internships in police station, forensic laboratories and research institutes.
- The students will also able to take a job in a forensic laboratories or police station even after completing a one-year course as they are able to collection, preservation and documentation of evidence, drawing a crime scene and doing preliminary analysis at crime scene.
- They will also be eligible for jobs in Government or non-Government agencies that are involved in legal and criminal investigations.

FORENSIC ANALYSIS OF BIOLOGICAL EVIDENCES

CREDIT DISTRIBUTION, ELIGIBILITY AND PRE-REQUISITES OF THE COURSE

Course title and Code	Credits	Credit distribution of the course			Eligibility Criteria	Prerequisite of the Course (if any)
		Lecture	Tutorial	Practical/Practice		
Forensic Analysis of Biological Evidences	2	0	-	2	XII Passed with Science	Nil

Course Objectives

The course aims to provide an understanding of the applications of biochemistry in forensic sciences through analysis of evidences, which will help students develop analytical and problem-solving skills for real life situation. The course will keep abreast with all recent developments and emerging trends in forensic science thus helping interested students take up forensic science as future course of study.

Learning outcomes

After completing the course students will be able to

1. Explain how a forensic investigation is initiated through preservation of evidences, as well as chemical, physical and biological methods of their analysis
2. Establish identity of an individual by serological evaluation, and DNA analysis.
3. Comprehend the importance of precision, reproducibility and accuracy in identification of a biological sample.
4. Evaluate and t identify the accurate age, sex and identity of an individual in skeletal remains in a forensic investigation.
5. Obtain hands-on-experience in some of the basic biochemical processes involved in forensic investigation.

Skill development and job opportunities

After completion of this course students would obtain the training in analysis of biological evidences. They will be encouraged to do short internships in forensic laboratories and research institutes. The students will also be able to take a job in forensic laboratories as they will know how to handle a forensic sample and do basic biochemical analysis

Unit I: Biochemical analysis of trace evidences **(3 Weeks/ 12 Hours)**

- Examination of Fiber and Soil
- Examination of Hair and Pollen

Unit II: Biochemical analysis of biological fluids as forensic evidence (3 Weeks/ 12 Hours)

- Preliminary and Confirmatory test for blood, semen and saliva and other biological fluids
- Blood group and blood protein analysis for identification of an individual
- Blood splatter analysis

Unit III: DNA Fingerprinting **(4 Weeks/ 16 Hour)**

- Extraction of DNA from biological samples (Blood/Semen/Saliva/Hair)
- DNA fingerprinting based on micro/mini satellite markers (PCR and Agarose gel electrophoresis)

Unit IV: Forensic Anthropology **(2 Weeks/ 8 Hours)**

- Determination of sex, age and ethnicity through skeletal remains
- Forensic odontology to determine age and identity of remains

Unit V: Field trip to a forensic laboratory and case study presentation (3 Weeks/ 12 Hours)

Teaching Methodology/Activities in the Classroom

Content presentations, virtual labs/videos, hands-on sessions and case study discussions

Assessment Patterns for Each Unit/Practical

Unit I: Assessment based on the results reported for the practical conducted (20 marks)

Unit II: Test on the topics covered (10 marks)

Unit III: Assignment for interpreting DNA fingerprinting results (15 marks)

Unit IV: Assessment based on the results reported for the practical conducted (10 marks)

Unit V: Case Study Presentation (10 marks)

Viva (5 marks)

Practical Record/File (10 marks)

ESSENTIAL READINGS

- James, S. H., Nordby, J. J. & Bell, S. (2014). *Forensic Science: An Introduction to Scientific and Investigative Techniques, Fourth Edition*: Taylor & Francis. ISBN 9781439853832
- Saferstein, R. (2018). *Criminalistics: An Introduction to Forensic Science, Twelfth edition*: Pearson Education. ISBN 10:0134477596, ISBN 13: 9780134477596
- Tewari, R. K., Sastry P. K., Ravikumar, K. V. (2002). *Computer Crime and Computer Forensic, First Edition*: Selective & Scientific Books
- Veeraraghavan, V. (2009). *Handbook of Forensic Psychology, First Edition*: Selective & Scientific Books

SUGGESTED READINGS

- Lee, H., Palmbach, T. & Miller, M. (2001). *Henry Lee's crime scene handbook, First Edition*: Academic Press ISBN 9780080507989
- Parikh, C. K. (2016). *Parikh's textbook of medical jurisprudence, forensic medicine and toxicology : for classrooms and courtrooms, Seventh Edition*: CBS Publishers and Distributors. ISBN 9788123926469

FORENSIC TOXICOLOGY

CREDIT DISTRIBUTION, ELIGIBILITY AND PRE-REQUISITES OF THE COURSE

Course title and Code	Credits	Credit distribution of the course			Eligibility Criteria	Prerequisite of the Course (if any)
		Lecture	Tutorial	Practical/Practice		
Forensic Toxicology	2	0	-	2	XII Passed with Science	Nil

1. Learning Objectives

The Learning Objectives of this course are as follows:

- Acquire a thorough understanding of the fundamental principles of toxicology, including how toxic substances impact the human body
- Explore the role of forensic toxicology in legal cases, such as post-mortem investigations, drug-facilitated crimes, and toxin detection in criminal cases
- Develop hands-on skills in analyzing biological samples using laboratory techniques like chromatography, spectroscopy and immunoassays
- Study the ethical and legal responsibilities of forensic toxicologists, with a focus on proper evidence handling, accurate reporting, and providing testimony in court

2. Learning Outcomes

The Learning Outcomes of this course are as follows:

- Students will be able to identify various drugs, poisons, and toxins, including narcotics, hallucinogens, alcohol, and environmental toxins, and understand their effects on human health.
- Students will gain practical experience in laboratory techniques such as spectrophotometry, chromatography (TLC) and immunoassays for analyzing toxic substances in biological samples.
- Students will learn how to analyze toxicological results from biological samples and interpret their significance in forensic investigations, with an emphasis on their impact on criminal cases and legal outcomes.

3. Main Course Structure

Wherever wet lab experiments are not possible the principles and concepts can be demonstrated through any other material or medium including videos/virtual labs etc.

Unit I: Fundamental principles of forensic toxicology and its significance in criminal investigations. **(6 Weeks/24 Hours)**

- **Laboratory 1**: Discuss and prepare a report on the basic principles of toxicology, including ADME, DRC, toxicokinetics, and toxicodynamics
- **Laboratory 2**: Discuss the classification of drugs and controlled substances, along with testing and screening methods
- **Laboratory 3**: Learn proper techniques for collecting, storing, and preserving biological samples for toxicological analysis
- **Laboratory 4**: Participate in a virtual demonstration of post-mortem analysis related to poisoning or drug overdose cases
- **Laboratory 5**: Discuss the effects of drug poisoning on various human body systems through case studies

Unit II: Toxicological analysis of substances using common laboratory tools and techniques. **(9 Weeks/36 Hours)**

- **Laboratory 6**: Conduct a crime scene investigation focused on searching for toxic substances, drugs, narcotics, and psychotropic substances
- **Laboratory7:** Perform toxicological analysis of biological samples using thin-layer chromatography, including the comparison and extraction of target molecules
- **Laboratory 8**: Perform spectrophotometric analysis of biological samples and compare them with known toxic substances for quantification
- **Laboratory 9**: Explore various methods for detecting alcohol and drugs in biological fluids using colorimeter
- **Laboratory 10-11**: Analyze case studies of famous poisoning incidents, such as notable historical poisonings and criminal cases
- **Laboratory 12**: Write and present a comprehensive toxicology report based on a real or hypothetical case investigation

4. **Teaching Methodology/Activities in the Classroom**

Content presentations, virtual labs/videos, hands-on sessions and case study discussions

5. **Assessment Patterns for Each Unit/Practical**

Unit I:

- Written report on the principles of toxicology and the topics discussed in class (ADME, DRC, toxicokinetics, toxicodynamics). (15 marks)
- Presentation and discussion on the classification of drugs and controlled substances, testing, and screening methods. (10 marks)

Unit II:

- Case Study Analysis and Report on the effects of drug poisoning on human systems. Class discussion and active participation in the analysis (10 marks).
- Practical evaluation of search and identification techniques used during crime scene investigations. Written report on findings from the simulated investigation (15 marks).
- Practical assessment on the use of thin-layer chromatography (TLC) for analyzing biological samples. Practical test on performing spectrophotometric analysis and comparing results with known toxic substances. (15 marks)

Viva (5 marks)

Practical Record/File (10 marks)

6. **Mapping with the Next Suggestive Course**

Forensic Chemistry

7. **Prospective Job Roles after a Particular Course**

Skill enhancement increases employability and credibility, providing an edge in both private and governmental sectors. Students can enter fields like crime scene investigation, forensic chemistry and toxicology.

8. Essential Reading

- Forensic Toxicology: Medicolegal Case Studies" by D. R. (Ruth) Gurdjian (2020) CRC Press, ISBN: 978-0367330155
- Forensic Science: From the Crime Scene to the Crime Lab" by Richard Saferstein (2017) Publisher: Pearson, ISBN-13: 978-013429229
- Forensic Science: An Introduction to Scientific and Investigative Techniques" by Norman J. Nordby (2013) by CRC Press, ISBN-13: 978-1466515570

9. Suggestive Reading

- Forensic Toxicology: Principles and Applications" by David J. M. H. and William G. McKinney (2007) Latest Elsevier, ISBN: 978-0128103937

10. Examination scheme and mode

Evaluation scheme and mode will be as per the guidelines notified by the University of Delhi from time to time.

INJURY AND DEATH

CREDIT DISTRIBUTION, ELIGIBILITY AND PRE-REQUISITES OF THE COURSE

Course title and Code	Credits	Credit distribution of the course			Eligibility Criteria	Prerequisite of the Course (if any)
		Lecture	Tutorial	Practical/Practice		
Injury and Death	2	0	-	2	XII Pass with Science	Nil

1. Learning Objectives

The Learning Objectives of this course are as follows:

- To explain how a medical examiner can determine the different modes of causing injury to the victim
- To make the students learn how the time of death of a cadaver can be deciphered
- To highlight the types of deaths that a person can encounter.

2. Learning Outcomes

The Learning Outcomes of this course are as follows:

- Students will be able to recognize the mode of injury by examining the pattern of wound on the victim.
- Students will be able to correlate how the type of injuries can give an idea that what type of death and what could have been the murder weapon.
- Students will be able to explain the purpose and relevance of autopsy.
- They will be able to understand how through autopsy the medical examiner can make out if death might have occurred due to drowning, electrical shock, or substance abuse.
- Students will be able to analyze and explain the causes for changes after death and the investigative issues to be addressed.
- Students will be able to understand the different types of death based on natural and unnatural causes.

3. Main Course Structure

Wherever wet lab experiments are not possible the principles and concepts can be demonstrated through any other material or medium including videos/virtual labs etc.

Unit I: Types of Injury **(7Weeks/28 Hours)**

- **Laboratory 1**: Classification of abrasions, contusions and lacerations as types of blunt end injuries
- **Laboratory 2**: Classification of incision, stab, fracture as types of sharp end injuries
- **Laboratory 3:** Discussion of medico legal aspects of injury
- **Laboratory 4-5**: Case study presentations on the basis of different types of injuries

Unit II: Types of Death **(8Weeks/32 Hours)**

- **Laboratory 6**: Understanding the classification of deaths as natural, accidental, suicidal and homicidal.
- **Laboratory 7**: Discuss features that can aid in determining the manner of death by strangulation, drowning or drug overdose.
- **Laboratory 8:** Discuss diagnostic features that help in determining the different modes of death (coma, syncope and asphyxiation).
- **Laboratory 9:** Determining time of death through algor mortis, livor mortis and rigor mortis
- **Laboratory 10:** Use of Forensic Entomology to determine time of death
- **Laboratory 11:** Discussion of medico legal aspects of death
- **Laboratory 12-13:** Case study presentations on the basis of different types, manner and mode of deaths

4. Teaching Methodology/Activities in the Classroom

Content presentations, virtual labs/videos, field visits and case study discussion

5. Assessment Pattern for each Unit/Practical.

Unit I:

- Assignment to determine types of injuries (10 marks)
- Case Study Presentations (20 marks)
- Test (10 marks)

Unit II:

- Assignment to determine types of deaths marks (10 marks)

- Assessment based on presentation of a crime through play marks (10 marks)

Viva marks (10 marks)

Practical Record/ File (10 marks)

6. Mapping with the Next Suggestive Course

None

7. Prospective Job Roles after a Particular Course

Skill enhancement increases employability and credibility, providing an edge in both private and governmental sectors. Students can be associated with any forensic laboratory for assistanceship with a medical examiner.

8. Essential Reading

- Wagner, Scott A (2009). *Death Scene Investigation: A Field Guide*. New York: CRC Press. ISBN# 978-1-4200-8676-8
- James, S.H. Nordby, J.J. and Bell, S. (2014). 4th Edition. *Forensic science: An introduction to scientific and investigative techniques*. Florida, USA: CRC Press. ISBN-13: 978-1439853832

9. Suggestive Reading

- Bardale, R. (2011). 1st Edition. *Principles of forensic medicine and toxicology*. New Delhi: Jaypee Brothers Medical Publishers. ISBN-13: 978-9350254936.

10. Examination Scheme and Mode

Evaluation scheme and mode will be as per the guidelines notified by the University of Delhi from time to time.

QUESTIONED DOCUMENT EXAMINATION

CREDIT DISTRIBUTION, ELIGIBILITY AND PRE-REQUISITES OF THE COURSE

Course title and Code	Credits	Credit distribution of the course			Eligibility Criteria	Prerequisite of the Course (if any)
		Lecture	Tutorial	Practical/Practice		
Questioned Document Examination	2	0	-	2	XII Passed with Science	Nil

1. Learning Objectives

The Learning Objectives of this course are as follows:

- Introduce students to the importance of questioned documents and their significance in forensic science, highlighting the various types of documents that can be contested, such as signatures on crucial documents, handwriting alterations, and forgeries in written materials
- To familiarize students with the different techniques and methods used in document examination, including handwriting analysis, ink analysis, and paper analysis, while also exploring the role of instrumental tools (e.g., UV light, infrared spectroscopy) in the investigation of questioned documents

2. Learning Outcomes

The Learning Outcomes of this course are as follows:

- Students will become familiar with forged documents and understand the different types of documents and materials that can be classified as such.
- Students will learn to identify and explain the various techniques used in questioned document examination, including both traditional methods and advanced technological tools.
- Students will critically assess the role of forensic document examiners in the legal context and gain an understanding of how their findings can impact judicial decisions.

3. Main Course Structure

Wherever wet lab experiments are not possible the principles and concepts can be demonstrated through any other material or medium including videos/virtual labs etc.

Unit I: Fundamental characteristics of handwriting and their role in individualization **(6 Weeks/ 24 Hours)**

- **Laboratory 1**: To analyze and compare the characteristic features of handwriting
- **Laboratory 2**: To examine natural variations in handwriting
- **Laboratory 3-4**: Comparison of known handwriting samples with questioned documents, focusing on consistency in formation, pressure, speed, and slant using specialized scanners
- **Laboratory 5**: To detect intentional corrections, modifications, alterations, or changes in forged documents
- **Laboratory 6**: To review and discuss the case studies related to forged handwritten document

Unit II: Forgeries in special documents **(3 Weeks/ 12 Hours)**

- **Laboratory 7**: To identify security features in currency notes, mark sheets, passports, and degree certificates
- **Laboratory 8**: To review and discuss case studies related to document forgeries, including fake currency, passports and educational documents

Unit III: Analysis of documents using both destructive and non-destructive methods through various tools and techniques. **(6 Weeks/24 Hours)**

- **Laboratory 9**: Analysis of various types of paper and ink using thin layer chromatography and spectrophotometry
- **Laboratory 10**: Microscopic and digital examination of unique paper features, such as thickness, fiber structure, and composition
- **Laboratory 11**: Comparative analysis of forged and known paper samples using the aforementioned paper characteristics

- **Laboratory 12**: Review and discussion of case studies that utilize the techniques covered in the previous labs

4. Teaching Methodology/Activities in the Classroom

Content presentations, virtual labs/videos, hands-on sessions and case study discussions

5. Assessment Patterns for each Unit/practical.

Unit 1:

- Assessment will focus on the various methods and techniques discussed for detecting document forgeries. Students will be evaluated on their understanding and ability to write about the different identification methods effectively (15 marks).
- Assessment will be based on the student's hands-on performance during the practical session, including the experiment execution and the outcomes observed. A viva/test will also be conducted to evaluate the student's understanding of the practical concepts (10 marks).
- Assessment will focus on the properties of various types of documents and paper covered in the unit. Students will be evaluated on their understanding of these properties and their application in document analysis (10 marks).

Unit II:

- Students will present case studies relating to different types of currency notes, identity documents, or other forms of evidence. The assessment will be based on the selection of cases, the depth and relevance of content, and the clarity of the presentation style (20 marks).

Unit III:

- Students will be assessed on their understanding and application of procedures used to identify ink samples on questioned documents. The assessment will focus on the detailed steps involved in the identification process and the accuracy of the student's explanation of the method (10 marks)

Viva (5 marks)

Practical Record/File (10 marks)

6. Mapping with the next suggestive course

Death and Injury

7. Prospective Job Roles after a particular course

Skill enhancement increases employability and credibility, providing an edge in both private and governmental sectors. Students can enter fields like crime scene investigation, forensic graphology and document analysis.

8. Essential Reading

- Forensic Science: From the Crime Scene to the Crime Lab" by Richard Saferstein (2017) Publisher: Pearson, ISBN-13: 978-013429229.
- Forensic Science: An Introduction to Scientific and Investigative Techniques" by Norman J. Nordby (2013) by CRC Press, ISBN-13: 978-1466515570
- Forensic Document Examination: A Desk Reference" by Max M. Willis (2004) CRC Press, ISBN-13: 978-0849307244

9. Suggestive Reading

- Scientific Examination of Questioned Documents" by James E. Starrs and R. D. MacDonald (2001), CRC Press, ISBN-13: 978-0849301457
- Forensic Handwriting Examination: A Definitive Guide" by Peter M. De Forest (2002) CRC Press, ISBN-13: 978-0849308432

10. Examination scheme and mode

Evaluation scheme and mode will be as per the guidelines notified by the University of Delhi from time to time.