

IIT MADRAS SCHOOL CONNECT

# Syllabus for the eight-week courses.

Certificate courses from IIT Madras, open to students in Classes IX to XII through Sanketana's School Connect partnership. Four cohorts run each year.

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**IX–XII**

CLASSES

**8 weeks**

ONLINE

**19**

COURSES

**CODE**

CERTIFICATE FROM IIT  
MADRAS

# The courses

Content on the following pages is reproduced from IIT Madras's published syllabus, grouped as IIT Madras groups them. Computing is listed first. Courses offered vary by cohort — ask us which are running.

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# An Introduction to Data Science and Artificial Intelligence

## Weeks 1-2 : What is AI - General pipeline

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- Data collection/Feature Engineering in various structured/unstructured settings
- Structured:
  - Vegetable Market expenditure data
  - Iris Dataset
- Unstructured:
  - Pixel values as raw representation of Images – handwritten digits data
  - Emails → features based on word count/ TF-IDF

## Weeks 3-4 : Types of Learning

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- Supervised, unsupervised and sequential learning
- Examples for learning
- Unsupervised learning
- K-means clustering
- Hierarchical clustering

## Weeks 5-6 : Algorithm

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- Supervised learning
- KNN
- Decision trees
- Neural network
- Training error and performance measures.
- Demo of image classification

## Weeks 7-8 : Learning with feedback

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- Real-world examples – question answering, healthcare, robot navigation
- How feedback affects the setting.
- A simple example of online learning – exam question answering with help from friends.
- How can one learn when no friend is good enough?

# Game Tech Explorers: Understanding Humans, Machines, and Play

## Week 1: Gaming and Human Senses

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- **Objective:** Explore how game technology simulates and interacts with human senses.
- **Examples of Senses in Gaming:** Learn how controllers, VR headsets, and motion sensors mimic human senses to make games more immersive.
- **Enhancing Immersion:** Understand how sensory technologies like rumble feedback and motion tracking improve the gaming experience.
- **Tech Behind Sensors:** Explore the basic working of microphones, cameras, and haptic motors that power modern gaming devices.
- **Hands-On Demo:** Compare a simple sensor (light/motion) with a human sense, similar to Wii motion tracking.

## Week 2: Action and Response in Games

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- **Objective:** Understand the principles of responsive game systems and player feedback.
- **Fast Response Systems:** See how reflex-based games, racing wheels, and vibration feedback test quick player responses.
- **Role of Actuators:** Learn how motors and haptic devices provide feedback that makes gameplay feel realistic.
- **Feedback Loops in Games:** Discover how input, processing, and output form the foundation of responsive game systems.
- **Hands-On Project:** Build a sensor-based trigger (e.g., a fan or LED lights up when a hand waves).

## Week 3: Perception, Logic, and Game AI

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- **Objective:** Introduce fundamental concepts of artificial intelligence and logic in game characters.
- **Classic Game AI Examples:** Study AI behavior in classics like Pac-Man and FPS games to see how simple logic drives characters.
- **Logic in Game AI:** Learn how if-then rules and decision trees create believable non-player characters (NPCs).
- **Intro to AI Tech:** Get a glimpse of decision tree structures and how they guide AI decision-making in games.
- **Hands-On Activity:** Code a simple decision tree for a game character using p5.js.

## Week 4: Hand Tracking in Games

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- **Objective:** Examine how hand gestures are used as a form of game control.
- **Hand Tracking Examples:** Discover how Wii controllers, Kinect, and VR systems use hand gestures to control gameplay.
- **Mapping Gestures to Actions:** Learn how hand movements are translated into specific in-game interactions.
- **MediaPipe and Pose-Tracking:** Get an introduction to modern pose-tracking tools that power hand gesture recognition.
- **Practical Activity:** Train a simple body-tracking model with Google Teachable Machine.

## Week 5: Eye Tracking in Gaming

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- **Objective:** Learn about the emerging field of eye tracking and its applications in gaming.
- **Eye Tracking in Games:** Explore how games use gaze for aiming, camera movement, and immersive horror experiences.
- **Gaze-Based Interaction:** Learn how controlling games with your eyes creates new gameplay possibilities.
- **Eye-Tracking Technology:** Understand the basic working of eye trackers and how they capture gaze movement.
- **Practical Activity:** Try a web-based gaze recorder demo.

## Week 6: AI and Speech Recognition

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- **Objective:** Explore how AI enables voice-based interaction and commands in games.
- **Voice in Games:** See how games like Hey You, Pikachu! and VRChat use speech for interaction.
- **Voice Commands in Gaming:** Learn how speech recognition enables control and communication in games.
- **AI Speech Technology:** Understand how AI handles accents, tone, and natural language to improve recognition.
- **Hands-On Demo:** Use Google Teachable Machine to try audio-based recognition.

## Week 7: Extended Reality (XR)

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- **Objective:** Get an introduction to the different forms of extended reality (VR, AR, MR) and their applications.
- **VR in Gaming:** Experience how VR games like Beat Saber and Half-Life: Alyx create full immersion.
- **AR and MR in Gaming:** Learn how Pokémon GO and HoloLens use AR/MR to add digital layers to the real world.
- **XR Hardware and Software:** Explore the basic principles of VR headsets, AR glasses, and MR platforms.
- **Practical Activity:** Try an AR app or AR filter and review the experience.

## Week 8: Final Project

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- **Objective:** Apply learned concepts to build a final project demonstrating a key game technology integration.
- **Project 1:** Build a voice-to-command action with p5.js (e.g., say "jump" to trigger an action).
- **Project 2:** Build a hand gesture-controlled bulb with p5.js (gesture turns bulb on/off).

# Introduction to Cyber Security

## Module 1 : Welcome to Cybersecurity

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- Why cybersecurity matters
- Some Famous cyber attacks
- What does it need to become a cybersecurity expert?
- Understanding of your computer system -- the computer system stack.
- **Hands on:** Understand what Operating System you are using?
- **Hands on:** Find your CPU?
- **Hands on:** Find your RAM?
- **Hands on:** Investigate your storage.
- **Hands on:** Is antivirus enabled?
- **Hands on:** Check the web browser? What is the version number? Is auto-security update enabled?

## Module 2 : Cryptography

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- Classical cryptography
- Modern Cryptography
- AES
- hash functions
- RSA
- digital signatures

## Module 3 : Passwords and Authentication

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- Strong and weak passwords.
- John the ripper
- Password managers
- Checking passwords and timing attacks
- Storing passwords
- Passwordless authentication – FIDO2

## Module 4 : Internet under the hood

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- Packets
- IP address
- DNS
- Routers
- Websites
- **Hands on:** Use ping, tracert / traceroute, nslookup
- **Observe:** How packets travel; DNS lookup
- **Mini challenge:** Find where a website is hosted.

## Module 5 : Popular Cyberattacks

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- malware
- ransomware
- social engineering
- phishing and fake websites
- Mini CTF -- A bunch of easy to difficult problems (around 20 of them), and they can solve as many as possible.

# Fun with Math and Computing

## Week 1-2: How do computers represent information?

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- **Topics:** binary number system, more general bases (like factoradics, etc), and some activities based on binary representations.

## Week 3-4: How do computers find things?

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- The first part will be about traditional search methods like binary search and then we talk about KMP-style pattern matching algorithms. Hands-on activities will include the 21 card trick and we will revisit ternary bases in this demonstration.

## Week 5-6: How can computers help with elections?

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- Challenges with coming up with voting systems, will explore issues around holding secure and fair elections, and finally a discussion of Arrow's impossibility theorem.

## Week 7-8: What makes financial transactions secure?

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- A discussion of cryptosystems, leading up to RSA and introducing some number theory along the way.

# Math Unplugged: Games & Puzzles

## Week 1: The Knight's Tour and Mathematical Exploration

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- Meet the chess pieces and discover how they inspire puzzles
- Non-attacking chess pieces and the classic knight's tour challenge
- Smart strategies: the Warnsdorff heuristic and the power of backtracking

## Week 2: Knight Tours on Rectangular Chessboards

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- Do knight tours exist on bigger, rectangular boards?
- Taking apart and understanding closed knight tours
- Why chessboard coloring matters: tours on  $4 \times n$  boards

## Week 3: Tours of Leapers

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- Beyond the knight: tours of leapers like the Camel and Giraffe
- A general look at when such tours exist
- Connection to graph theory: Hamiltonian circuits

## Week 4: The Peg Solitaire Game

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- Can you solve Peg Solitaire on the English board?
- The French version – and how group theory comes to the rescue!

## Week 5: The World of Infinities, Part 1

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- A quick survey of really big numbers
- Injections, surjections, bijections and how we compare sizes of sets
- The strange but famous Hilbert's Hotel paradox

## Week 6: The World of Infinities, Part 2 – Beyond Infinity

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- How do you "list" a set?
- Not all infinities are the same size!
- The big question: is there a "largest" infinity?

## Week 7: Counting Areas of Shapes

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- What do we really mean by "dimension"?
- A first step into areas under curves: the idea of integration
- Pick's Theorem: counting areas neatly on the lattice

## Week 8: A Road to the Future – Open Problems and Directions

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- Frankl's Union-Closed Sets Conjecture
- Singmaster's Conjecture: how many times can a number appear in Pascal's triangle?
- The Twin Primes Conjecture: are there infinitely many pairs of primes 2 apart?
- Ramsey Theory: why it's "better to fight the aliens"
- Thinking ahead: exploring higher studies in mathematics

# Molecular Engineering: Opportunities and Challenges

## Week 1-2: Molecules: Simple and Complex

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- How are molecules built?
- Look around: What molecules are involved in building things?
- What molecules have to do with colors?

## Week 3: Investigating Molecular Interactions

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- Probing a Chemical Reaction
- Probing a Physical Process

## Week 4-6: Importance of Molecular Design for Applications

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- Sensing
- Display Technology and LED
- Biological Ruler
- Medical Imaging
- Solar Energy Harvesting
- Photo-catalysis

## Week 7-8: Career Path in Chemistry

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- Difficulty in Learning Chemistry
- Methods of Learning Chemistry
- Programs in Chemistry
- Job Opportunities

# Introduction to Ecology

## Week 1: Biodiversity

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- What is it? How do you connect with ecology
- Description of components of biodiversity
- Examples of abiotic components
- Understanding ranges of species and range overlap

## Week 2: Exploring nature around you

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- Documenting biodiversity & elements of study design
- Use online maps and functionalities available within them to understand the potential diversity around you.
- Demonstration with some example sites. Tricks and tips on looking for various elements of Diversity.
- How to find insects – what are the natural history drivers for insect diversity
- How do we identify birds and different ecology?
- Introduction to study design

## Week 3: Creating a project

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- Learn to create a biodiversity project
- Login, create observations and work with iNaturalist.

## Week 4: How do you measure biodiversity?

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- What is Biogeography?
- What are the global patterns that are recognised today?
- How are biogeographic patterns in India?

## Week 5: Spreadsheet exercises on biodiversity

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- How will you examine biodiversity data that you have collected?
- How can you integrate the learnings of biodiversity measurements with your data?

## Week 6: How does biodiversity connect with evolution?

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- Ecological processes result in evolution and creation of new species.
- Example of Darwin's Finches

## Week 7: Example of Anoles from the Caribbean

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- Study biodiversity and evolution with an example of Anoles from the Caribbean.

## Week 8: Understanding biodiversity from genes and sounds

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- Often understanding biodiversity is challenging because it depends on the human construct of what a species is.
- We will explore the ideas of taxonomy and the modern methods of understanding species using data from the genes of the species being studied.
- We will show that using genetics our understanding of biodiversity in India has changed remarkably.
- We will switch gears to understand what is cultural diversity – through bioacoustics or sounds produced by different species.
- We will provide a brief introduction to how sounds are studied
- What are the patterns of acoustic diversity that we know?

# An Introduction to Electronic Systems

## Weeks 1-2 : Introduction to Electronic Systems

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- Electronic Miniaturization
- Dissection of Mobile phone
- Battery / Charger specifications
- Battery rating – Ah, Wh, V
- Charger rating – A, W

## Weeks 3-4 : The Physics behind Electrical resistance

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- Voltage
- Current
- Resistance
- Power and Energy dissipation

## Weeks 5-6 : Introduction to time varying signals

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- Overview of operation of an electric motor
- Overview of operation of a microphone
- Overview of operation of an electric generator
- Prominence of sinusoidal signals
- Characterisation of sinusoidal signals – Amplitude, RMS, Frequency, Time Period

## Weeks 7-8 : Energy of Time varying signals

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- Calculation of energy of time varying signals
- Harmonics in time varying signals
- Electricity bill calculation

# An Introduction to Architecture and Design

## Week 1 : Power of Architecture and Design In Our Life

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- Introduction to Architecture
- Scope and Diversity
- Introduction to Design
- Elements and Principles of Architecture

## Week 2 : Elements of Architecture and Design

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- Element of Architecture–Point
- Element of Architecture–Line
- Element of Architecture–Line to Shape
- Element of Architecture–Line to Shape, Shape to Form

## Week 3 : Principles of Architecture and Design- Aesthetics

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- Principles of Architecture – I
- Principles of Architecture – II
- Scale in Architecture and Graphics
- Proportion in Architecture and Graphics

## Week 4 : Introduction to Composition

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- Shape Composition Using Tangrams
- Shape Transformation Using Shape Grammar as a Tool
- Exercise in Proportion
- Exercise in Scale

## Week 5 : Principles of Architecture and Design of higher order

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- Repetition and Movement
- Pattern and Unity
- Rhythm and Variety
- Hierarchy and Harmony

## Week 6 : Demonstration of how 'what we think' can become executable drawings

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- How to Draw Plans; Exercise involving Drawing Plan
- How to Draw Elevation; Exercise involving Drawing Elevation
- How to Draw Section; Exercise involving Drawing Section
- How to Draw Perspective; Exercise involving Drawing Perspective

## Week 7 - Application of Principles in everyday life - (Logo Design, Jaali Design)

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- Abstraction as a tool for Creative Thinking
- Colours and its moods
- Tessellation for pattern creation
- Orientation to Take Home Project and Entrance Examinations for Architecture and Design

## Week 8 - Summary of previous weeks (Introduction to Final Exam (Project))

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- Introduce Final Exam Project- Option 1- Color Wheel
- Introduce Final Exam Project- Option 2- Tessellation
- Introduce Final Exam Project- Option 3- Golden Proportion
- Summary, Conclusion and Ideas for Visits to Institution

# An Introduction to Engineering Biological Systems

## Week 1

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- Initial comments and Game for product choice
- What makes bioproducts?
- Biotechnology experiments – Let's start with curd...!
- Inside a Biotech Lab: Tools, Equipment, and a Virtual Walkthrough

## Week 2

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- What are the different cell types?
- Microscopy: The Story and the Science
- Prokaryotes and eukaryotes
- Microscope in Focus: Watch, Learn and Try It

## Week 3

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- How is the bioproduct made on a large scale?
- Bioprocessing and Bioreactors: Grow, Process, and Use
- The need to look at the cell level

## Week 4

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- Cell membrane and lipids
- Why does a cell make a bioproduct?
- Carbohydrates
- Biomolecules: Guess, Test, and Learn

## Week 5

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- Proteins
- Finding proteins around us!
- Enzymes

## Week 6

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- How are proteins made in the cell?
- Let us pull out banana DNA
- DNA visualisation: From banana to bands
- Understanding the cell
- Bioinformatics: Databases and Blast
- Similarity to Structure: Exploring Proteins with Bioinformatics

## Week 7

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- Fundamental biomolecules
- The DNA copy machine
- Take home project
- Glucose sources

## Week 8

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- Engineering metabolism and genetics
- The science of cutting and pasting DNA

# Introduction to Product Design

## Week 1: Introduction to Industrial Design

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- What is Design
- Role of Designers
- Indian Examples of Industrial Design

## Week 2: Observation & Design Awareness

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- Identifying Problems in Daily Life

## Week 3: Users & Empathy

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- Understanding Users
- Identifying Needs
- Understanding Contexts

## Week 4: Form, Function & Materials

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- Relationship Between Shape and Use
- Material Selection and Application

## Week 5: Design Process

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- Structured Approach to Problem-Solving

## Week 6: Sketching for Designers

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- Visual Thinking Techniques
- Communicating Ideas Through Sketches

## Week 7: Hands-on Design Project

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- Problem Identification
- Concept Development

## Week 8: Design Careers & Pathways

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- Educational Opportunities in Design
- Entrance Examinations
- Professional Career Paths

# The Fundamentals of Aerospace

## Week 1: World of Flying Vehicles

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- Classification of aircrafts
- Flying vehicles
- Forces on an airplane
- Closure thoughts

## Week 2: The Invisible Air

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- Demonstration
- Shape of the object: What happens if you change the shape of the object?
- More Demonstrations
- Closure thoughts

## Week 3: Air and planes

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- Bluff and streamlined bodies
- How to move an airplane
- Control surfaces
- How should these surfaces move?
- Concluding thoughts

## Week 4: Faster and faster

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- How fast do different airplanes travel? Introducing the idea of Mach number.
- Demonstration
- Different engines: turbofan, turbojet, solid rockets, liquid rockets and hybrid rockets
- Where is the oxygen? Inside a turbojet engine. Inside a rocket.
- Closing thought: How fast are our interplanetary satellites travelling?

## Week 5: Can we leave orbit?

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- Thought experiment
- How exactly does our atmosphere look?
- What types of orbits exist?
- Polar and geostationary orbit. What types of satellites use what types of orbits?
- Plan an orbit to Mars. Different options for orbits.

## Week 6: Slowing down

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- How do we slow down? The idea of parachutes and drag
- Why does a slit in the engine open during landing? Similarly, why do multiple surfaces protrude from the wing?
- What happens to the energy when you slow down a space shuttle? What happens to the kinetic energy? How do you cool the surface when the air temperature is greater than the melting point?
- Challenging environmental factors: Ice, snow, rain, heavy winds

## Week 7: Spinning wings

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- The power of hover
- Let us look at a helicopter, why do we have a tail rotor? Need for counter torque, basis Newton's third law.
- Where are the control surfaces on a helicopter?
- Autorotation: Has nature perfected this technique already?
- Why was flying on Mars a challenge? Why not fly a fixed wing on Mars?

## Week 8: Let us build a quadrotor

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- Introduce components of a quadrotor
- Talk about how input from the pilot's hands results in the motion of the quadrotor through space.
- Demonstration: Putting together the quadrotor
- Demonstration: Showing some flights.

# Introduction to Chemical Engineering

## Week 1: Key concepts of Chemical Engineering

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- Introduction to Chemical Engineering – from toothpaste to satellite launch propellant
- Rocket, EV
- Jaggery / sugar production
- Batch / continuous manufacturing. Unit operations; process; scale up; reaction engineering
- Systems and Control
- Thermodynamics; Separation

## Week 2: Exercise/Hands-on Based

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- Do-it-yourself videos; Demonstration videos; conversations.

## Week 3: From industrial scale to molecular – Products in our surroundings – FMCG and Pharmaceuticals

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- RO water purifier
- Extraction from plants
- Pharma industry
- Heat transfer; Mass transfer
- Fluid flow
- Drug delivery: diffusion and osmosis
- Chemical reactors

## Week 4: Exercise/Hands-on Based

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- Do-it-yourself videos; Demonstration videos; conversations.

## Week 5: Chemical industrial sector – current achievements and challenges

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- Battery
- Semiconductor device / membrane electrode assembly
- Refinery
- Materials
- Thin films / deposition
- Distillation; Cracking; catalysis

## Week 6: Exercise/Hands-on Based

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- Do-it-yourself videos; Demonstration videos; conversations.

## Week 7: Industry 4.0, AI/ML, Aerospace, Biomedical.

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- Cell programming
- Atomic and molecular picture
- Reaction engineering and control (advancements in ChemE)
- Sustainability, Energy, Ecology
- HPC, AI/ML
- TBD – Summary: promise of a career in Chemical Engineering

## Week 8: Exercise/Hands-on Based

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- Do-it-yourself videos; Demonstration videos; conversations.

# Economics, Finance, and Money Matters

## Week 1: Value, Money & Inflation

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- Is Money the Same as Value?
- Why Do We Trust Money?
- If Everyone Became Twice as Rich Overnight, Would We Be Better Off?
- Why Do We Value Brands if the Product Is the Same?
- **Learning Outcome:** Students understand value vs. money, trust in currency, inflation effects, and brand perception.

## Week 2: Exercises

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- Simple inflation calculations, brand perception comparisons, currency trust scenarios.
- **Activity:** Compare prices of branded vs. generic goods, discuss perception differences
- **Learning Outcome:** Apply theoretical concepts from Week 1 to practical examples.

## Week 3: Incentives, Risk & Everyday Choices

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- Why Do People Work?
- Why Do Some People Take Big Risks?
- Why Do Lotteries Exist if They're Bad Bets?
- Can Free Things Be Bad for You?
- **Learning Outcome:** Students understand incentives, risk-taking, probability, and perverse incentives.

## Week 4: Exercises

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- Calculate expected values for simple gambles and investments.
- **Activity:** Identify real-world examples of perverse incentives.
- **Learning Outcome:** Apply incentive theory and risk analysis to everyday decisions.

## Week 5: Markets, Failures & Game Theory

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- Why Trade Instead of Making Everything Ourselves?
- If Trade Is Good, Why Is It Unpopular?
- When Markets Don't Work: The Market for Lemons
- Why Can't We Just All Stop Polluting?
- **Learning Outcome:** Students learn trade theory, market failures, and collective action problems.

## Week 6: Exercises

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- Trade simulation with comparative advantage.
- **Activity:** Simulate prisoner's dilemma in small groups.
- **Learning Outcome:** Experience trade-offs, cooperation, and market failures in practice.

## Week 7 : Platforms, AI & the Future Economy

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- Why Do People Follow the Crowd in Markets?
- Platforms: Why Uber, Zomato, and Airbnb Work Differently
- When Platforms Misbehave
- Economics of AI: Will It Change Everything?
- **Learning Outcome:** Students understand modern platform economics, AI's impact, and digital market risks.

## Week 8: Exercises

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- Analyze a platform's pricing strategy or network effects.
- **Activity:** Debate AI's impact on jobs and inequality.
- **Learning Outcome:** Apply platform economics and AI concepts to real-world scenarios.

# An Introduction to Law

## Week 1: Introduction to Law

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- Law, Morality and Justice
- Branches of Law
- Career Opportunities in Law – New Trends

## Week 2: Practical applications & scenarios

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- Indian Constitution as Fundamental Law
- History of the Constitution Making in India
- Structure of the Indian Constitution– Federalism & Separation of Powers
- Citizens, State and the Constitution – Fundamental Rights, Directive Principles and Fundamental Duties

## Week 3: Courts, Citizens and the Constitution: Fundamental Rights

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- Kind of rights given to citizens, individuals and social & religious groups.
- Why does any law cannot violate fundamental rights given in the Constitution?

## Week 4: Introduction to Criminal Law – Crimes & Legal Defenses

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- How is criminal law different from civil law
- Legal Glossary in Criminal Law explained
- Ingredients of a crime – mens rea and actus reus
- Legal Defenses – Insanity, Involuntary Intoxication, Age, Self-Defense

## Week 5: Introduction to Private Law: Contracts & Torts

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- Concepts of Contract Law will be explained.
- Nature and Legal Remedy under Tort Law will be explained

## Week 6: Applications

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- New Areas in Law – Intellectual Property Law, Environmental Law, Arbitration Law Technology Law
- The new areas of law will be discussed.

## Week 7: Courtroom, procedures

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- Revision of Substantive Concepts in Law

## Week 8: Revision, Clat

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- Preparation for CLAT – Skills and Basics

# Humanities Unplugged

## Week 1: What Are the Humanities? Why Do They Matter?

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- What do the Humanities study?
- How Humanities help us make sense of the world
- **Activities:** Humanities Bingo: A game-based intro to famous works (books, films, art)
- **Outcome:** Understand that Humanities are all around us — in books, films, culture, and personal stories.

## Week 2: Humanities in Everyday Life

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- Pop culture, memes, movies, songs as cultural texts
- Understanding symbols, storytelling, and emotion in everyday things
- **Activities:** Meme Decoder Challenge & Play cultural detective
- **Outcome:** Learn to "read" the world through images, jokes, and music.

## Week 3: Storytelling: My Identity, My Story

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- What makes you, YOU?
- Exploring culture, memory, and voice
- **Activities:** Memory Mapping, One-Minute Video
- **Outcome:** Reflect on personal experiences and to show how our personal stories are also connected to larger ideas like history, community, and identity.

## Week 4: From Scrolls to Screens - the evolution of humanities

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- Oral to digital, Printing press and modernity, human stories in the age of interactive screens
- Humanities meets technology
- **Activities:** from cave-art to virtual games, from epic to emojis.

## Week 5: Digital Selves and Media Literacy

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- How digital media shapes opinion and identity
- Understanding bias, algorithms, and influence
- Ad Dissection: Choose a social media ad — What does it sell? What feelings does it use?
- **Outcome:** Build media awareness and sharpen online critical thinking which is an important skill set in Humanities education

## Week 6: Humanities and Social Change

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- Power of storytelling in social movements
- When words and art make a difference
- **Outcome:** To understand how the Humanities have historically contributed to and continue to inspire social change
- To understand how creative expressions shape public thought and policy

## Week 7: Humanities in the Real World

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- Real people, real paths — where Humanities takes you
- **Activities:** Virtual Career Wall
- **Outcome:** Connect studies with future possibilities and real-life stories – how with training and expertise humanities education can help transform some of your interests and hobbies into potential career choices

## Week 8: Pathways and Portfolios

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- Courses, scholarships, and universities in India and abroad
- Building a personal academic/career map
- Interview Project: Interaction with scholars/students
- Talk to someone (friend, relative, teacher) about how Humanities affects their work or life
- **Activities:** Create Your Path: Design a flowchart or map of where you want to go (e.g., "From Film Buff to Screenwriter")
- **Outcome:** A sense of direction and practical possibilities ahead

# Introduction to Digital Humanities

## Module 1: What is Digital Humanities? | Foundations and the Humanities-Technology Interface

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- From Fr. Roberto Busa's Index Thomisticus to today's 'AI DH': a short history of the field
- The two-way relationship — how computation reshapes humanities inquiry, and how humanities concepts shape technology design
- Setting up the course's recurring question: what does humanities thinking bring that engineering alone cannot?

## Module 2: Algorithmic Bias | How Do Machines 'Learn'? Who Teaches the 'Machines'?

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- How machine learning models are trained on human-authored data, and why datasets carry cultural assumptions
- Case studies of bias in language models, image generators, and recommendation systems
- Using humanities tools — critical theory, representation studies — to audit and correct algorithmic bias

## Module 3: Augmented, Virtual and Extended Realities (AR/VR/XR) | Immersive Technologies in the Humanities

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- How narrative theory and embodiment studies inform immersive storytelling design
- Exploring AR/VR applications in museums, heritage sites, and memory projects
- Ethical questions of immersion: whose stories, whose bodies, whose history is being represented

## Module 4: Games as Cultural Texts

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- Reading video games through literary and cultural theory — narrative, semiotics, myth
- Case study: tracing how a game's design choices encode cultural memory and meaning
- What game studies teaches interface and interaction designers

## Module 5: Serious Games and Game-Based Learning

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- Principles of game-based pedagogy drawn from learning theory
- Designing a mini learning-game concept around a humanities theme
- Where humanities-informed design improves engagement over conventional EdTech

## Module 6: Deep Mapping and Spatial Storytelling

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- GIS and digital cartography as humanities tools, not only technical ones
- Layering historical, cultural, and personal narrative onto place, drawing on memory studies
- Building a simple deep map of a local or personal place

## Module 7: Building a Digital Portfolio

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- Consolidating the AI, gaming, mapping, and archival work from earlier weeks into one showcase
- Using free, browser-based tools appropriate for school-level access
- Framing the portfolio as evidence of humanities-technology thinking for future study or work

## Module 8: Career Pathways and Future Possibilities

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- Emerging roles at the humanities-technology intersection: UX research, digital archiving, AI ethics, cultural data science
- Why 'AI DH' — the integration of AI and humanistic inquiry — is a growing specialisation globally
- Guidance on next steps: courses, competitions, and portfolios for interested students

# Introduction to Forensic Sciences - I (For Classes IX & X)

## Week 1: Every Contact Leaves a Trace

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- What Forensic Science Actually Is, and What It Is Not
- The First Fifteen Minutes: A Crime Scene Officer's Account
- Building Your Locard Log
- The Crime Scene Officer: One Job, Explained

## Week 2: Your Original Password

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- Loops, Whorls and Arches: The Grammar of a Fingerprint
- The Calcutta Bureau: How India Gave the World Fingerprint Classification
- Lifting and Classifying Your Own Ten Prints
- The Fingerprint Examiner: One Job, Explained

## Week 3: The Scene Is a Group Project

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- Securing, Searching and Recording a Scene
- The Case That Turned on a Single Fibre
- Photographing and Sketching a Scene in a Shoebox
- The Trace Evidence Analyst: One Job, Explained

## Week 4: The Body Keeps Receipts

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- From Blood Groups to Barcodes: How DNA Identifies a Person
- The Exculpatory Case: When the Science Freed Somebody
- Extracting DNA on Your Kitchen Table
- The DNA Analyst: One Job, Explained

## Week 5: Your Handwriting Snitches

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- Forgery, Line Quality, and Why Graphology Is Not Science
- Reading a Threat Message: A Forensic Linguist at Work
- Whodunit Wrote It: Comparison and Ink Chromatography
- The Document Examiner and Forensic Linguist: One Job, Explained

## Week 6: Caught in 4K

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- Metadata, Deleted Files and the Myth of Vanishing Evidence
- Inside a Device Examination, and the Frauds Aimed at Teenagers
- Running the Delulu Detector on Five Media Files
- The Cyber Forensic Analyst: One Job, Explained

## Week 7: The Dose Makes the Poison

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- Why Quantity, Not Substance, Decides a Poison
- Inside the Instrument Room: The Adulteration Work Nobody Hears About
- Testing Turmeric and Milk in Your Own Kitchen
- The Forensic Chemist and Toxicologist: One Job, Explained

## Week 8: Bones, Bugs, Bites and Beasts

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- What a Skeleton, an Insect and a Pollen Grain Can Tell You
- Prosecuting a Trafficking Case on the Strength of a Single Scale
- Bone Detective: Estimating Height and Measuring Your Error
- The Wildlife Forensic Scientist and Anthropologist: One Job, Explained

# Introduction to Forensic Sciences - II (For Classes XI & XII)

## Week 1: What the Job Actually Is

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- The Forensic Ecosystem and the Expert's Duty to the Court
- How the Profession Changed When Forensic Visits Became Law
- Mapping Three Roles to Their Real Qualification Routes
- Twelve Role Families, Twelve Subject Decisions

## Week 2: The Laboratory Sciences Path

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- The Instrument Shelf: What Each Machine Actually Answers
- Two Laboratory Careers: A Forensic Chemist and a Ballistics Expert
- Reading a Chromatogram and Writing the Finding
- Getting In: Degrees, Entrance Tests and What Selectors Look For

## Week 3: The Biological Sciences Path

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- From Swab to Profile: Inside a DNA Laboratory
- Disaster Victim Identification and the Wildlife Casework
- Reading an Electropherogram and Stating the Honest Caution
- Getting In: The Postgraduate Step Most Learners Miss

## Week 4: The Medicine and Behaviour Path

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- Cause, Manner and Mechanism: What a Body Can Establish
- What Forensic Psychology Is, and What Television Is Not
- Building a Biological Profile and Knowing What to Refuse
- Getting In: Medicine, Nursing, Odontology, Anthropology and Psychology

## Week 5: The Digital and Cyber Path

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- Imaging, Hashing and Why You Never Work on the Original
- The Device That Broke a Case, and the Money Trail That Followed
- Verifying an Acquisition and Recording the Chain of Custody
- Getting In: The Cyber Routes That Do Not Need an Engineering Degree

## Week 6: The Language, Documents and Law Path

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- Idiolect, Authorship and the Multilingual Indian Problem
- The Forged Will and the Ransom Note
- Writing an Authorship Opinion, Limits Included
- Getting In: Forensic Careers from a Humanities Stream

## Week 7: The Management, Finance and Governance Path

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- Following the Money: Forensic Accounting and Fraud Examination
- The Fraud That Was Found in a Spreadsheet
- Finding the Transaction That Does Not Belong
- Getting In: Forensic Routes from Commerce and Arts

## Week 8: Building Your Pathway

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- The Stream and Subject Map, Domain by Domain
- An Admissions and Alumni Panel Answers the Questions
- Presenting and Defending Your Career Blueprint
- Eligibility, Calendars and Making the Decision

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