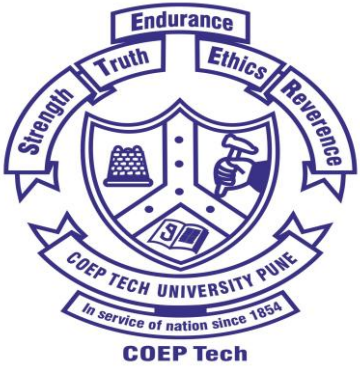




FIRST YEAR ENGINEERING ORIENTATION

Welcome First Year Students to Engineering Exploration (Laboratory)

A multidisciplinary journey into hands-on design thinking, prototyping and real-world problem solving

Course Details

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Evaluation Scheme

Continuous In Semester Evaluation : 100 marks

Semester I:

- Artificial Intelligence & Machine Learning
- Electrical Engineering
- Computer Engineering (Division 1 & Division 2)
- Mechanical Engineering
- Instrumentation & Control Engineering

Semester II:

- Civil Engineering
- Computer Engineering (Division 3 & Division 4)
- Electronics & Telecomm. Engineering
- Manufacturing Engg. & Industrial Management
- Metallurgy and Material Engineering

What is Engineering Exploration?



A Flagship First-Year Course

- A project-based, multidisciplinary course
- Shifting the learning paradigm from theoretical study to active, hands-on creation



Engineers vs. Scientists

- **Scientists discover** the key **principles** governing the natural world, **Engineers synthesize knowledge** to build solutions that never existed before.
- This course empowers you to move from consumer to creator.



The Interdisciplinary Mindset

- **Modern engineering challenges rarely belong to a single domain.**
- Successful innovations blend mechanical mechanisms, electronic controls, software algorithms and human-centric design thinking

Why Engineering Exploration?

Bridging Traditional Curriculum Gaps

- Engineering Exploration to bridge theory and practice
- Instilling an engineering mindset, design confidence and creative **problem-solving skills** right at the start of the student journey.
- Instead of providing ready-made answers, **teachers ask purposeful and guiding questions that encourage students to think, explore, and discover solutions independently.**

5

Students per project team

14

Weeks to a working prototype



Early Experience

Early exposure to engineering workflows to understand what engineers truly do



Break Department Silos

Real-world problems are never isolated to one field. Course brings mechanical, electrical and software domains together seamlessly.



Fosters a Design Mindset

Teaches empathy mapping, need-statement synthesis, and iterative testing

14 WEEKS

Semester Course Roadmap

1

2

3

4

Weeks 1 – 3

- Introduction to Engineering and Engineering Study
- Engineering Ethics
- Sustainability in Engineering

Weeks 4 – 7

- Design Thinking and Ideation
- Mechanisms and Resource Specifications
- Platform-based Development

Weeks 8 – 11

- Project Management
- Virtual Modeling and Implementation

Weeks 12 – 14

- Project Completion and Documentation
- Project Exhibition

FACILITIES

Studio Space

Creative space for learning, thinking,
and designing



Activity based learning



FACILITIES

Tinkering Laboratory/ Maker's Space

Primary workspace for building, testing and refining prototypes



Rapid Prototyping

3D printers



Electronics Bench

Sensor modules,
microcontroller kits and
development boards



Workshop Tools

Laser cutting/ engraving
machines, milling machines,
lathe machine



Hand Tools

Power tools, hand drills,
riveting gun

Relevance of the course in AIML & Computer Science Engineering



Key Learning

- **Algorithmic Logic:** Flowcharts & pseudocode
- **Embedded Coding:** Microcontroller firmware
- **IoT Protocols:** Sensor data telemetry pipelines



Importance

Acts as the brain of modern systems, enabling automated decision-making and smart hardware control



Application Areas

Smart home IoT hubs, edge AI vision nodes, autonomous navigation software, and mobile device interfaces



Domain Relevance

Connects pure code with physical hardware interfaces, teaching real-time system constraints

Relevance of the course in Civil Engineering



Key Learning

- **Load Analysis:** Structural equilibrium & stress
- **Material Pick:** Strength-to-weight optimization
- **Eco Design:** Resource efficiency & footprint



Importance

Ensures mechanical stability, structural integrity, and environmental sustainability of prototypes



Application Areas

Smart structural health monitoring, eco-housing modules, automated truss design, and modular bridges



Domain Relevance

Instills structural safety standards and smart infrastructure principles into hardware prototyping

Relevance of the course in Electrical Engineering, Electronics & Telecommunication Engineering and Instrumentation & Control Engineering

Key Learning

- **Circuit Design:**
Schematic drafting & breadboarding
- **Power Distribution:**
Voltage regulation & safety
- **Sensor Calibration:**
Ultrasonic, IR & IMU sensors
- **Control Loops:** PID implementation
- **Actuation:** Servo & stepper drive control

Importance

- Powers all system modules and translates physical phenomena into digital sensor inputs
- Combines mechanical action, electronic sensing, and software control into unified automated systems

Application Areas

Battery management systems, motor drivers, sensor breakout boards, and solar power converters, Autonomous mobile robots (AMRs), medical devices

Domain Relevance

Develops critical hardware troubleshooting and electronic integration confidence early on

Relevance of the course in Mechanical Engineering & Manufacturing Engg & Industrial Management



Key Learning

- CAD Modeling: 3D parametric physical design
- Kinematics: Linkage mechanism synthesis.
- Rapid Build: Laser cutting and 3D printing



Importance

- Provides physical structure and mechanical advantage required to translate electrical energy into motion



Application Areas

Robotic manipulators, EV chassis design, automated conveyor mechanisms, and drone frames



Domain Relevance

Establishes real-world mechanical tolerance and structural validation skills before advanced courses

Relevance of the course in Metallurgy & Material Science Engineering

Key Learning

- **Material Selection:** Polymer & metal properties
- **Process Flow:** Fluid kinetics & heat transfer
- **Chemical Safety:** Hazard containment protocols

Importance

Dictates component durability, thermal resilience, chemical compatibility, and material lifecycles

Application Areas

Battery electrolyte cooling, bio-degradable prototyping filament, water filtration units, and coatings

Domain Relevance

Applies material chemistry to real physical hardware, bridging bench chemistry with prototype design

Welcome to **Engineering Exploration**

Start your journey from passive learner to innovator.

