TECHHUB SOLUTIONS

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3D PRINTING COURSE - SYLLABUS

Course Content

Core Modules:

Introduction to Additive Manufacturing (AM):
- History, evolution, and benefits of 3D printing.
- Comparison with conventional manufacturing.
- Applications in aerospace, healthcare, automotive, etc...

Computer-Aided Design (CAD) & Modeling:
- Fundamentals of 3D modeling (AutoCAD 2D/3D, Solidworks).
- Sketching, creating shapes, and solid modeling.
- CAD for AM: STL format, data translation.

3D Printing Technologies & Processes:
- FDM (Fused Deposition Modeling).
- SLA (Stereolithography) & DLP.
- SLS (Selective Laser Sintering) & SLM (Selective Laser Melting).
- Binder Jetting, LOM (Laminated Object Manufacturing).

Advantages and Applications of 3D Printing:
- Rapid Prototyping & Iteration
- Design Freedom, Create complex geometries, internal structures
- Cost-Effective for Low Volume
- On-Demand & Digital Inventory:
- Material Efficiency
- Customisation: Easily tailor products (e.g., medical implants, consumer goods) to individual needs without extra tooling.
- Light weighting: Create strong, optimised parts with less material, beneficial for aerospace and automotive.
- Democratisation: Lowers barriers for individuals and small businesses to manufacture.
- Healthcare: Custom surgical guides, implants (dental, joint), prosthetics, anatomical models for surgical planning.
- Aerospace & Automotive: Lightweight components, complex brackets, rapid prototypes, tooling, and functional parts.

- Consumer Goods: Personalised phone cases, custom jewellery, unique figurines, ergonomic tools.
- Education & Research: Visual aids, complex models for learning, rapid experimentation.
- Construction: Architectural models, potentially printing houses.
- Tooling & Fixtures: Custom jigs, fixtures, and end-of-arm tooling for manufacturing.
  Art & Design: Complex sculptures, unique decorative items.

Materials for 3D Printing:
- Polymers, metals, ceramics, composites.
- Material forms (wire, powder, liquid) and properties.
- Support materials.

Fused Deposition Modelling – 3D Printing process:
- How does FDM 3D printing work?
- Is there a difference between desktop and industrial FDM printers?
- What are the characteristics of FDM 3D printing?
- What are common materials for FDM 3D printing?
- Post-processing for FDM 3D printing.
- What are the best practices for printing with FDM?

Bambu Lab machine:
- Machine basics.
- Hands on operation with bamboo lab machines.
- Machine calibration.
- Machine repairing and maintenance.
- Machine troubleshooting.

Bambu Lab Studio:
- Software basics.
- Import & Arrange: Load STL, OBJ, or 3MF files and position/manipulate them on the virtual build plate.
- Configure Settings: Select your printer, nozzle, filament type, and process settings (layer height, infill).
- Slice: Generate the G-code, preview the layers, and see print time/filament estimates.
- Print/Monitor: Send the job wirelessly to your printer and manage it remotely.

Hands-on practical 3D printing:
- Designing simple objects.
- Simulation Labs.
- Artistic Effects.
- Explore multi-material or multi-colour printing by changing filaments mid-print.

Slicing & Machine Operation:

- File preparation, slicing, and programming
- Support structures
- Model infill
- Positioning and orientation
- Generating the G-Code
- Print troubleshooting.

Post-Processing:

- Analysing the piece or model
- Support removal, cleaning, sanding, polishing.
- Assembly, Prototyping, Finishing techniques.

Quality & Defects:

- Inspection, testing, and common print failures.
- Assembly and correction.

Limitations of Printed Objects:

- Limitations of additive manufacturing and 3D printing.
- Limitations depending on the type of technology.
- Introduction to the limitations of FDM technology.

Project Work:

- Designing and printing functional objects.
- Improving existing designs (e.g., from Thingiverse).
- Design and develop new products for home and commercial use.

Product Design and Development:

- Project based product design and development.
- Prototyping of various parts.
- Enhancing creative skill with the help of multiple software's
- Electronic components assembly and working.

Key Skills Gained:

- 3D modeling & design thinking.
- Prototyping & rapid manufacturing.
- Troubleshooting & problem-solving.
- Innovation & entrepreneurial thinking.

Exam on completion: Review of every student. Performance analysis.

Basics:

Quantitative Aptitude (Maths)
- Number Systems: Basics, Divisibility Rules, Types of Numbers.
- Arithmetic: Percentages, Ratio & Proportion, Profit & Loss, Averages, Mixtures, Simple & Compound Interest, Time & Work, Time, Speed & Distance, Problems on Ages, Partnerships, Pipes & Cisterns, Boats & Streams, Trains.
- Algebra: Basic Identities, Equations, Simplification.
- Geometry & Mensuration: Polygons, Circles, Area, Volume, Height & Distance.

Basic English:
- Parts of Speech: Nouns, Pronouns, Verbs (action, helping), Adjectives, Adverbs, Prepositions, Conjunctions.
- Sentence Basics: Subject-Verb Agreement, Simple Sentence Structure (SVO).
- Verb Tenses: Simple Present, Simple Past, Present Continuous, Future (will).
- Key Structures: "To be" (is, am, are), "There is/are", "Have to/Need to", Modals (Can, Should, Will).
- Articles & Plurals: A/An/The, Singular/Plural forms.

Basic computer Fundamentals:
- Introduction: What is a computer, its history, types, and basic applications (e-governance, entertainment).
- Hardware: CPU, Memory (RAM, ROM), Input Devices (keyboard, mouse), Output Devices (monitor, printer).
- Software: System Software (OS) vs. Application Software (Word, Excel).
- Operating System (OS) (GUI-based, e.g., Windows)
- User Interface: Desktop, Icons, Taskbar, Menus, Windows.
- File Management: Creating, renaming, copying, deleting files/folders.
- Settings: Changing date/time, display, adding/removing printers.
- Internet Basics: Browsers (Chrome, Edge), search engines, effective searching.
- Email: Creating accounts, sending/receiving, attachments, etiquette.
- Networking: Basic concepts (LAN, WAN).

MS OFFICE:
- Types, input/output, memory, OS fundamentals (Windows).
- Internet Basics: Searching, email creation, sending/forwarding.
- MS Office Overview: History, core components (Word, Excel, PowerPoint, Access).
- Microsoft Word (Word Processing)
- Document Creation: Typing, saving, opening, printing.
- Formatting: Fonts, size, bold, italics, alignment, bullets, numbering, styles.
- Layout: Headers, footers, page setup, margins, columns, watermarks.
- Objects: Inserting tables, pictures, shapes, SmartArt, charts, symbols.
- Tools: Spell check, grammar check, Thesaurus, Mail Merge.
- Microsoft Excel (Spreadsheets)
- Interface: Rows, columns, cells, worksheets, navigation.
- Data Entry & Formatting: Text, numbers, dates, currency, text wrapping, merging cells.

- Formulas & Functions: Simple calculations (SUM, AVERAGE), relative/absolute references.
- Data Management: Sorting, filtering, conditional formatting, and data validation.
- Charts: Creating and formatting various chart types (pie, bar, line).
- Microsoft PowerPoint (Presentations)
- Presentation Basics: Creating slides, themes, layouts, and adding text.
- Content: Inserting images, clip art, audio, video, tables, SmartArt.
- Effects: Slide transitions, text/object animations, timing.
- Delivery: Slide show view, presenter view.

Interview Guidance:

- Personal Profile (DAF Analysis): Your education, hometown, hobbies, achievements, and work experience.
- Current Affairs: National, international, socio-economic issues, and governance challenges.
- Subject Knowledge: Optional subject basics, degree subjects, and technical knowledge.
- Situational & Opinion-Based Questions: Handling hypothetical scenarios and expressing balanced views.
- Personality Development: Mental alertness, logical reasoning, clarity of expression, balance of judgment, and leadership traits.
- Communication Skills: Body language, confidence, articulation, and online presence.