JAIPUR ENGINEERING COLLEGE
AND RESEARCH CENTRE

Curriculum by University

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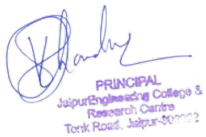

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Machine Learning using python- Day wise Syllabus

Day	Topics 4hours/day
1	Introduction to Machine Learning, History, Applications, Introductory concept of python, Data structures ,Control flow, Functions
2	Modules and packages, File input and output, Exception handling, Standard libraries, Preliminaries of Statistics
3	Statistic Data types, Measure of Central Tendency & Dispersion, Probability Theory, Normal Distribution, case study, Scatter Diagram
4	Correlation Analysis case study, Confidence Interval, T-distribution, Case Study, Confusion matrix, Precision, Recall, F-score
5	Pre Processing, Classification algorithm: Decision Tree, GINI, case study
6	Entropy, KNN, SVM, Linear classifier: Naïve Bayes Classifier, Case study
7	Logistic regression, Regression Analysis, Linear Regression, Multiple Linear Regression, Case study
8	Random Forest, Poisson Regression, Lasso & Ridge Regression, Zero-Inflated Regression, Negative binomial regression
9	Multinomial Regression, Survival Analysis, Web Extraction, Case study, Clustering: Euclidean distance, Manhattan Distance
10	Hierarchical clustering, k-means clustering, k-Medoids, DBSCAN, PAM, CLARA, Case Study
11	Dimension Reduction, PCA, Word cloud, , Introduction to Text Mining, case study
12	Data Extraction and NLP, Introduction to Deep learning, Introduction to neural network, ANN for classification, case study
13	ANN for regression, Case study, Introduction to RNN, Difference between ANN and RNN, Methods and functions of RNN
14	RNN algorithm writing, RNN Case study, Projects

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Internet of Things – Day wise syllabus

Day	Topics 4hours/day
1	Basics of Electronics, Introduction to IoT concepts and Technologies, Internet of Things Architecture and Implementation.
2	Arduino Programming Language concepts. Introduction to Arduino Embedded Development Board and ATmega Microcontroller
3	Working with Arduino IDE 1.8.6 and programming Arduino MEGA Hardware. Interfacing Arduino with LED, Breadboard. Data Representation concepts.
4	Serial Communication – UART Protocol, USB Protocol. UART to USB Conversion. Working with Serial ports in Arduino. Introduction to Sensors and Concepts. InfraRed Proximity Sensor Principles, working and connecting with Arduino.
5	IoT Communication Wired and Wireless Protocols Layers and Protocols - TCP/IP Layer, OSI Model. IEEE Standards – Bluetooth Standards. Bluetooth Module – Working of HC05 Module, Bluetooth Standards, Specifications, Protocol Stack, versions, controlling devices using Bluetooth module.
6	Collecting Real time data using Temperature Sensor (DHT11) – DHT11 libraries and principle. Wireless Technologies & Standards – NodeMCU WiFi Development Boards. Connecting NodeMCU WiFi module to Internet.
7	Cloud Computing – Introduction, Services and Importance in IoT. Introduction to ThingSpeak Cloud and Working with ThingSpeak API Keys and Channels. Data collection from Sensors and automatic storage in ThingSpeak Cloud using NodeMCU.
8	ESP8266 WiFi Chip – Working Principle, pin outs, connection with Arduino MEGA board, AT Commands. Setting up TCP Client using ESP8266. Data collection from Sensors and automatic storage in ThingSpeak Cloud using ESP8266 and Arduino MEGA.
9	Send Messages to IoT devices using Talkback. REST Client. Control IoT Devices remotely from REST Client in System and Mobile.
10	Python – Introduction , Environment Setup, Basic Building blocks – Variables, , Operators, IO functions, Data types, Control Structures, Data Structures – List, Tuple, Set, Dictionary, Functions, Modules
11	Python Common Gateway Interface – Introduction, Enabling CGI Server in Windows, Implementing Client – Server Architecture. Raspberry Pi – Introduction, Raspberry pi as an IoT gateway, Connecting with Raspberry pi through VNC. Make Raspberry pi as Server using Python CGI.
12	Integration of Cloud with Raspberry pi as an IoT Gateway. Pubnub Cloud – Publishers and Subscribers Architecture. Publishing data to Pubnub cloud using Raspberry pi. Real time data storage in cloud using Arduino, ESP8266 and Raspberry pi.
13	IoT Protocol - Message Queing Telemetry Transport Protocol(MQTT) – Architecture, Machine to Machine Communication. Implementing MQTT Broker using Raspberry pi
14	IoT Data Analytics – Data Analytics using Python, Introduction to Python Libraries – Matplotlib, Mayavi, NumPy, SciPy, Pandas, Scikit learn. Anaconda Installation and Data Analysis in Jupiter.

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Artificial Intelligence

Day-wise syllabus

Duration: 68 Hours

Day	Topic (4 hours/day)
1	Introduction to Artificial Intelligence, History, Applications, Statistic essentials
2	Statistic essentials, pre program preparation, Introduction to python programming, Control flow, Functions.
3	Data structures, Modules and packages, File input and output, Exception handling.
4	Standard library, Introduction to machine learning, Supervised algorithm for AI problem
5	Supervised algorithm for AI problem
6	Introduction to OPEN-CV, Library and packages to use for image and video processing, Concept of image segmentation in AI
7	Introduction to NLP(nltk), Text mining using NLP, Text mining processes tokenizer
8	Text mining processes(stemming, lemmatization, pos, syntax, chunking etc), Use of ML and NLP for solving problem
9	How Deep Learning Works?, How Neural Network works?, Understanding various components of Neural Networks., Keras, Theano, Tensor Flow – Installation, Introduction to Keras, Theano, Tensor Flow., Functionalities of Tensor flow.
10	Single and multi layer perceptron, Pros and cons of single and multi layer perceptron, Training using back propagation.
11	Convolution Neural Network.
12	Use of OPEN-CV with deep learning, Introduction to reinforcement learning.
13	Q-Learning, case study Uber Autonomous car, Google road map using BFS and DFS, case study.
14	Introduction to Robotics, Parts of a robot, Actuator design and components, Introduction to Raspberry-pi, Installation of Raspbian, Input and Output programming using python, Sensor Interfacing using python.
15	Integrating AI features with Raspberry-PI. Integrating AI robot using IOT, Applications object segmentation, object recognition.
16	Applications sentimental analysis, chatbot.
17	Real time objects detection using AI robot, counselling taking robot design using Raspberry pi.

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Blockchain - Day wise Syllabus

Day	Topics (2 hours/day)
1	Blockchain Introduction, Trading in current system, Centralised, Decentralised and Distributed System, Origin and History of Blockchain, Why we need Blockchain, How Distributed ledger will work, CryptoEconomics, Signatures, Proof of Work, Proof of State, Zero Knowledge Proof
2	Types of Blockchain, Blockchain Applications, Cost of transactions, Use cases in Blockchain
3	Ethereum Blockchain, Introduction, Elements of Ethereum, Ethereum Transactions, Ethereum Virtual Machine, Messages, Ethereum Network, Clients and Wallets
4	Ethereum Environment -Remix IDE, Ropsten network, MetaMask, Truffle, Web3.js, Setting up of Private Network
5	Introduction to Solidity – Working of Solidity Program, import statements, Data types Lab Session – Solidity Programs using Datatypes
6	Operators, Function Lab Session – Solidity Programs using Functions and operators
7	References and Mapping Lab Session – Solidity Programs using References and mapping
8	Constructors, Enums,Events Lab Session – Solidity Programs using Constructors, Enums and Solidity Events
9	Smart contract using Remix IDE,ATOM IDE and testrpc
10	Lab Session - Smart contract using Remix IDE,ATOM IDE and testrpc
11	Smart Contract using Atom IDE, ROPSTEN Network and Metamask
12	Lab Session – Create a Smart contract and deploy it in Ropsten network
13	Smart Contract using Ganache, truffle and deploying in private network – Explaining the Solidity file, Migration file
14	Smart Contract using Ganache, truffle and deploying in private network – Explaining test files in solidity,Front end
15	Smart Contract using Ganache, truffle and deploying in private network
16	Smart Contract using Ganache, truffle and deploying in private network – Deploying in private network

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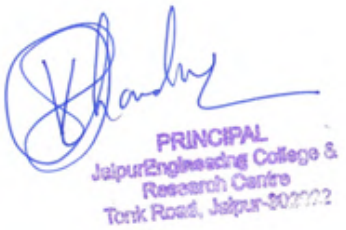
17	Lab Session – Create a Smart contract using Ganache, truffle and deploy in private network – Write test file in solidity
18	Smart Contract using Ganache, truffle and deploying in private network – Explaining the Solidity file, Migration file
19	Smart Contract using Ganache, truffle and deploying in private network – Explaining the front end and test files using javascript
20	Lab Session - Smart Contract using Ganache, truffle and deploying in private network – Write test files in javascript
21	Hyperledger - Blockchain for business, Chaincode, Hyperledger frameworks, Hyperldeger tools, Assets, Nodes, Channels, Types of Nodes Workflow of Hyperledger fabric
22	Hyperledger Composer, Modelling language(CTO), Hyperledger Playground
23	Lab Session – Hyperledger Program
24	Creating business network in Hyperledger Playground.



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Essentials on Full Stake Development

S.No	TOPICS
	Introduction to Hyper Text Markup Language(HTML5)
1	Introduction HTML
2	HTML Basics
3	HTML Elements
4	HTML5 Semantic
5	HTML Attributes
6	HTML Headings
7	HTML Paragraph
8	HTML Styles
9	HTML Formatting
10	HTML Quotations
11	HTML Comments & Colour
12	HTML CSS, Links and Images
13	HTML Lists
14	HTML Blocks
15	HTML Classes
16	HTML Layout
17	HTML Responsive
18	HTML Forms,Tables
	Cascading Style Sheets
20	Introduction CSS3
21	CSS3 Syntax
22	CSS3 How To
23	CSS3 Colours
24	CSS3 Backgrounds
25	CSS3 Padding
26	CSS3 Height
27	CSS3 Width
28	CSS3 Margin
29	CSS3 Shadows
30	CSS3 Text
31	CSS3 Font
32	CSS3 Links
33	CSS3 Tables
34	CSS3 Lists
35	CSS3 Outline
36	CSS3 Display
37	CSS3 Position
38	CSS3 Float
39	CSS3 Images
40	CSS3 Pagination
41	CSS3 Buttons
42	CSS3 Responsive
43	CSS3 Animations
44	CSS3 Drop-downs

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Essentials on Full Stake Development

45	Introduction to Bootstrap
46	Bootstrap Basics
47	Bootstrap CSS
48	Bootstrap JS
49	Introduction to Javascript
50	Javascript Basics
51	jQuery, JSON
	MongoDB
52	Introduction to MongoDB
53	MongoDB Environment
54	MongoDB Create Database
55	MongoDB Drop Database
56	MonogDB Create Collections
57	MongoDB Drop Collections
58	MongoDB Read Operation
59	MongoDB Write Operations
60	MongoDB Data Modeling
61	MongoDB Administration
62	MongoDB Security
63	MongoDB Schema
64	MongoDB Indexes
65	MongoDB Storage
66	MongoDB Replications & Sharding
	ExpressJS
68	Introduction to Express Framework
69	Getting Started with Express Your first Express App
70	Express Routing - Implementing MVC in Express, Middleware- Using Template - Engines Error Handling - API Handling - Developing Template Engine - Using Process Managers
71	Security & Deployment
	Angular
72	Introduction to Angular
73	Building Blocks
74	Routing
75	Observable
76	Forms
77	Pipes
78	HTTP Request
79	Angular Modules
80	Animation
81	Unit Testing
82	Promises
	Node.Js
83	Getting started
84	Node Core

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Essentials on Full Stake Development

85	mongodb node modules
86	Connecting Node.js to Database
87	REPL Terminal
88	Callbacks Concepts
89	Event Loop
90	Event Emitter
91	Buffers & Streams
92	Web modules
93	Web Scokets
94	Body parser
95	Debugger
96	Payment Gateway
97	E-mail validation
98	SEO, DNS,HOST,SMTP Basics
99	GitHub
100	Heroku
101	Project Guideline

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Finance 80 hours Course

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Ethical Hacking - Day wise Syllabus

Day	Topics (2 Hrs /day)
1	Introduction to Ethical Hacking, Hacking Terminologies, Vulnerability assessment and penetration testing Concepts, Ethical Hacking concepts and scope, Information Security controls
2	Footprinting concepts and Objectives, Footprinting through search engines, Website footprinting, Email footprinting
3	WHOIS footprinting, Network footprinting, DNS footprinting, Footprinting through social Engineering, Countermeasures
4	Overview of network scanning, Scanning Methodology, Check for live system
5	Check for open Ports, Banner Grabbing, Network diagrams, Countermeasures
6	Enumeration concepts, NetBIOS Enumeration, SNMP Enumeration, LDAP Enumeration
7	NTP Enumeration, SMTP and DNS Enumeration, Countermeasures
8	Vulnerability Assessment, Vulnerability Management cycle, Vulnerability Assessment solutions
9	Vulnerability Assessment Scoring Systems, Vulnerability Assessment reports
10	System Hacking Methodology, Gain Unauthorized Access, Escalating Privileges
11	Executing Applications, Hiding files, Covering Tracks, Countermeasures
12	Introduction to Malware, Various malware and threat
13	Trojan Concepts, Virus, stages of virus and Worms, Countermeasures
14	Sniffing Concepts, MAC Attacks, DHCP Attacks
15	Spoofing Attack, ARP poisoning, DNS Poisoning, Countermeasures
16	Social Engineering Concepts, Social Engineering Techniques
17	Impersonation on social Networking Sites, Identify Threat, Countermeasures
18	DoS/DDoS Concepts, Dos/DDOs Attack Techniques, Botnets, Countermeasures
19	Session hijacking Concepts, Network Level Session Hijacking,
20	Application Level Session Hijacking, Tools and Countermeasures
21	IDS Firewall and Honeypot concepts, Evading IDS, Detecting Honeypots,
22	Firewall and Honeypot solutions, Countermeasures
23	Web Server concepts, Attack Methodology, Web Server Attacks, Countermeasures

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Ethical Hacking - Day wise Syllabus

24	Web Application Concepts, Web App Threat, Hacking Methodology, Countermeasures
25	SQL Injection concepts, SQL Injection Methodology, Types of SQL Injection
26	Evasion Techniques, Countermeasures
27	Wireless Concepts, Wireless Encryption, Wireless Threats
28	Wireless Hacking Methodology, Hacking Wireless Networks, Countermeasures
29	Mobile Platform Attack vectors, Hacking Mobile Platforms, Hacking Android OS
30	Mobile device Management, Mobile security guidelines, Countermeasures
31	IOT Architecture,IOT Communication model,IOT Threats,IOT Hacking Methodology
32	Introduction to cloud Computing, Cloud computing Threats
33	Cloud Computing Attacks, Cloud Security, Cloud Countermeasures
34	Cryptography concepts, Encryption Algorithms, Disk Encryption, Cryptography Attacks, Countermeasures.

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Digital Marketing Program - Day-Wise syllabus

Day	Topics
1	Digital Assets Marketing Overview, Domain Names, Hosting CMS (Content Management Systems) Understanding, Structure Your Website using Word press
2	Structure Your Website Using Wordpress (Contd), Plugins, SEO Plugins Understanding, Understanding of Meta Tags
3	Free Tools to get Copyright Free Images, Image Editing Techniques Using Canva, Create ebooks using Canva, Understanding of Lead Magnets
4	Evolution of Search Engines, Understanding of SEO (Search Engine Optimization), On-Page and Off-Page Optimization Techniques, Keyword Research Tools (Free and Paid), Laser focus Techniques to Generate Quality Traffic and Leads
5	Advance SEO Techniques, On-Page SEO, Content Research Techniques for the Webpage, Structure Content as per SEO Specifications
6	SEO (Contd), Understanding Backlinks (Off-Page SEO), Domain Authority Checker Tools and Understanding, Understanding do-follow and no-follow backlinks, Backlinks submission Techniques
7	Laser Focus Targeting Methods using Google Ads, SEM - Search Engine Marketing Setup Google Ads Platform, Google Ad Campaigns
8	Google Ad Account Hierarchy, Google Search Campaign Setup, Ad Extensions
9	Google Ad Bidding Strategies, ROI and ROAS Understanding, Display Ad Setup
10	Video Ad Setup- YouTube, Google Remarketing Techniques to Achieve Sales Objective, Global Site Tag Implementation
11	Social Media Marketing Overview, Facebook As a Platform for Organic Reach, Create Facebook Business Page, Understanding of Followers , Facebook Groups for relevancy and reach, Facebook Business Manager Account Setup
12	Facebook Ad Account Structure, Setting Up of FB Ads, Facebook Custom Audience, Custom Conversion to achieve the campaign Objective
13	Instagram Platform for organic reach, Understanding of Hashtags and relevancy, Instagram Profile Optimization, Instagram DM to Increase organic reach, Understanding Instagram Reels, Videos etc
14	Email Marketing Techniques, Email Sequence to achieve Sales Objective, Understanding Upsells and Downsells Techniques, Sales Funnels and Tools, Lead Generation Funnel Setup
15	Freelancing Techniques to Achieve Financial Independence, Affiliate Marketing Techniques, Platforms to get products and Earn Affiliate Commissions

Note: Students should clear free certifications on Google Search Ad, Google Display Ad, and Google Video Ad by the end of the training program.

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Course on Robotics (Arduino) - Syllabus

S.No	Topics
	INTRODUCTION TO Arduino BOARD
1	Introduction to Arduino board, Types of Arduino board, Software installation, Intorduction to Arduino IDE, Arduino Programming Language concepts.
2	Programming Arduino Hardware , Introduction to the supply circuit, Introduction to LED, Interfacing of led with Arduino. Project -1 Controlling LEDs through Arduino
3	Introduction to sensor, Classification of sensor, Working principle of sensor, Working details of IR sensor, Interfacing IR sensor with Arduino. Project-2 Obstacle finder using IR Sensor Introduction to PIR sensor, Interfacing of PIR sensor with Arduino. Project-3 Home Security system using PIR Sensor
4	Introduction to Temperature and humidity sensor(DHT11), Working fundamentals of two physical quantity on same sensor Project – 4 Working with Temperature & Humidity Sensor Introduction to soil moisture sensor, Pull up and Pull down concept using Arduino, Interfacing of button with Arduino, Interfacing of high power relay to control AC devices. Project-5 Automatic Plant irrigation System
5	Fundamentals on different light pattern using LED. Sensor interfacing with led pattern. Project -6 Automatic lights Fundamentals of Ultrasonic sensor (HCSR04), Interfacing ultrasonic sensor with Arduino. Project - 7 Obstacle finding by submarines using Ultrasonic Sensor
6	Fundamentals of vibration sensor, Interfacing vibration sensor with Arduino Project-8 Vibration Sensor Fundamentals of MQ series of sensor, Interfacing gas and flame sensor with Arduino Project-9 Home safety guard using Arduino (gas and flame sensor)
7	Introduction to Biomedical sensing devices, Working principle of heartbeat and pulse sensor. Interfacing of heartbeat and pulse sensor with Arduino. Project – 10 Healthcare: Heartbeat Checking with Pulse Sensor Introduction to communication, different types of communication medium, Fundamentals of RFID card and reader, working principle of RFID. Project – 11 Token based shopping management system using RFID

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Course on Robotics (Arduino) - Syllabus

8	Integrating multiple buttons using matrix formatation, Input and output definition to control multiple buttons using Arduino. Project – 12 Keypad controlled robot using Arduino Introduction to integration of multiple features with Arduino, Interfacing buttons and IR sensors for wireless control. Project – 13 IR Remote Controlled Robots
9	Introduction DC motor, Use of motor driver circuit, working of motor driver circuit. Project – 14 Robotic car design using DC motor Introduction Servo motor, Use of motor driver circuit, working of motor driver circuit. Project – 15 Human fingers prototype using Servo Motor
10	Introduction Stepper motor, Use of motor driver circuit, working of motor driver circuit. Project – 16 Automatic curtain remover using Motors: Stepper Motor Introduction to HC05 and HC06 module, Interfacing of Bluetooth module with Arduino. Project – 17 Bluetooth Controlled Robots
11	Introduction to speed sensor, working principle of speed sensor, interfacing speed sensor with Arduino. Project – 18 Automobile speed controlling using speed sensor
12	Working principle behind obstacle avoidance, Interfacing of IR sensor and motor with Arduino, component assembling. Project -19 Obstacle avoider Robot
13	Working principle behind follow me robot, Interfacing of sensors and motor with Arduino, component assembling. Project – 20 Follow-Me Robot
14	Introduction to wireless module, Interfacing of wireless module, component assembling. Project – 21 wi-fi Enabled Robots
15	Introduction to degree of freedom, Introduction to actuator design, Integrating motors and different joints for robot design. Project -22 Humanoid

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Course on Robotics (Arduino) - Syllabus

16	Fundamentals of sensor deployment, Integrating different sensor with Arduino. Project -23 Home automation System

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Quality First

Software: SolidWorks

Duration: 40 HRS

Session 1:

- Introduction to CAD, CAE, PDM
- Introduction to Solidworks
- Features of SolidWorks
- Various products available in SolidWorks for Product Design, Simulation, Communication
- SolidWorks Graphical User Interface: Feature manager design tree, Callouts, Handles, Confirmation corner, mouse buttons, keyboard shortcuts, Command Manager,
- Hardware and Software requirements, SolidWorks Task Scheduler, SolidWorks Rx

Session 2:

- **Sketch Entities:** Inference line, Centerline line, Line, Circle, Arc, Ellipse, Rectangle, Slots, Polygon, Parabola, Ellipse, Partial Ellipse, Spline, Spline tools, Spline on surface, Equation driven curve, Points, Text, Construction geometry, Snap, grid

Session 3:

- **Sketch Tools:** Fillet, Chamfer, Offset, Convert entities, Trim, Extend, Split, Jog, Mirror, Dynamic Mirror, Move, Copy, Rotate, Scale, Stretch, Sketch pattern
- Make path, Close Sketch To Model, Sketch picture, Check Sketch for Feature, Area hatch/Fill
- **Blocks:** Make block, Edit block, Insert block, Add/Remove Entities, Rebuild, Save, Explode
- **Relations:** Adding Sketch Relation, Automatic relations
- **Dimensioning:** Smart, Horizontal, Vertical, Ordinate, Horizontal ordinate, Vertical ordinate, Align ordinate, Fully define sketch
- Sketch Diagnosis, SketchXpert, 3D Sketching, Rapid Sketch

Session 4:

- Part Modeling Tools
- Creating reference planes
- Creating Extrude features: Direction1, Direction2, From option, Thin feature, Applying draft, Selecting contours
- Creating Revolve features: Selecting Axis, Thin features, Selecting contours
- Creating Swept features: Selecting, Profile and Path, Orientation/twist type, Path Alignment, Guide Curves, Start/End tangency, Thin feature

Session 5:

- **Creating Loft features:** Selecting Profiles, Guide curves, Start/End Constraints, Centerline parameters, Sketch tools, Close loft.
- **Selecting geometries:** Selection Manager, Multiple Body concepts
- **Creating Reference:** Points, axis, coordinates

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Software: SolidWorks

Duration: 40 HRS

Session 6:

- Creating curves
- Split curve, Project curve, Composite curve, Curve through points, Helix and Spiral
- Creating Fillet features
- Inserting Hole types

Session 7:

- Creating Chamfer
- Creating Shell, Creating Rib
- **Creating Pattern:** Linear pattern, Circular pattern, Sketch driven pattern, Curve driven pattern, Table driven pattern, Fill pattern, mirror

Session 8:

- Assembly Modeling Tools
- Introduction to Assembly Modeling & Approaches: Top down and Bottom up approach
- **Applying Standard Mates:** Coincident, Parallel, Perpendicular, Tangent, Concentric, Lock, Distance, Angle

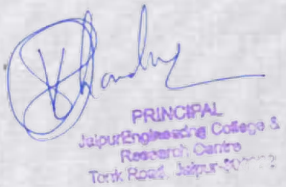
Session 9:

- Generating Drawing Views
- Introduction To Angle Of Projection
- **Generating Views:** Generating Model View, Projected Views, Inserting Standard 3 View
- View creation relative to model, Inserting predefined views, empty views, Auxiliary Views, Detailed Views, Crop view, Broken –Out Section, Broken Views, Section View, Aligned Section View, Alternate Position View, Working assembly specific view, Drawing properties, Manipulating views

Session 10:

- Sheet Metal Design
- Concepts in Sheet metal design bend allowance bend deduction, K-factor
- Inserting Base Flange, Sheet Metal Tab, Edge Flange, Miter Flange, Hem, Jog
- Creating Break Corner/Corner Trim, Closed Corners, Rip
- Inserting Sketched Bend, Fold/Unfold, Forming Tools

_____ End _____



Software: Ansys

Duration: 40 HRS

Introduction to CAE

- Introduction to CAE
- General procedure to conduct FEA
- FEA software
- Key Assumptions in FEA
- Types of Engineering Analysis
- Important terms and definitions
- Classification of materials
- Exercises included for practice
- **Introduction to ANSYS Workbench**
- **Sketching and Part Modeling in Design Modeler**
- Introduction to Modeling
- Introduction to Design Modeler Window
- **Illustration 1:** I-section

Solid Modeling Fundamentals

- Overview
- Introduction
- Extrusion
- Sketching
- Exercises included for practice
- Defining Material Properties
- Introduction to Engineering Workspace
- Creating and Adding Materials
- Assigning Material to the Beam
- Assigning Material to the Assembly

Meshing

- Introduction
- Meshing of Plate with Holes
- Generating the mesh, optimize the model and generating the local mesh
- Assembly Meshing

Static Structural Analysis

- Introduction to Static Structural Analysis
- Pre-processing
- Solution
- Post-processing

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Software: Ansys

Duration: 40 HRS

- **Static Structural Analysis of:** Cantilever Beam, Plate with a central circular holes, Plate with a square slot, Pressure vessel, Bracket
- Clevis assembly

Wizard and Tools

- Overview
- Introduction
- **Static loadings:** Ductile materials, Brittle materials
- **Fatigue loading:** Ductile material
- Exercises included for practice

Surface and Line Model

- Overview
- Introduction
- Sheet with circular hole-plane stress
- Bracket
- Line body model
- Exercises included for practice

Natural Frequencies

- Overview
- Introduction
- Performing the Modal analysis
- Specifying analysis settings
- **Modal analysis:** Cantilever beam, Simply supported beam, Chime, Connecting rod, Motor cover Assembly

_____ End _____

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Software: CATIA

Duration: 40 HRS

Session 1:

- **Introduction:** What is CATIA V5, Design Intent, System Requirements, Getting Started, Understand the CATIA Interface, Workbenches, Menus and Toolbars, Finding Tools, Specification Tree, Compass, Graphic Properties, Message Bar, Document Management
- **Understanding View Manipulation:** Fly mode, Fit All In, Pan, Rotate, Zoom In, Zoom Out, Normal View, Multi View, Quick View, View mode, Hide/Show, Swap Visible Space
- **Understanding Standard Toolbar:** New, Open, Save, Save Management, Print, Cut, Copy, Paste, Undo, Redo

Session 2:

- Introduction to Sketcher
- **Entering Sketcher Workbench:** Basic Sketching, Positioned Sketching
- **Profile Creation Using:** Profile, Predefined Profile, Circle, Spline, Conic, Line, Point, Axis
- Understanding Sketch Tools
- Creating Construction/ Standard Element
- Applying Geometrical/ Dimensional Constraints
- Understanding User Selection Filter toolbar
- Understanding Visualization Toolbar
- Cut part by Sketch Plane
- 3D Element visualization
- 2D Element visualization
- Diagnostics
- Dimensional Constraints
- Geometrical Constraints
- Sketch Workflow

Session 3:

- **Editing Profile using:** Corner, Chamfer, Relimitations, Transformation, 3D Geometry
- **Understanding Constraints:** Constraints, Constraint Creation, Contact Constraint, Fix together, Auto Constraint, Animate Constraint, Edit Multi – Constraint
- Introduction to Part Design
- **Creating Sketch-Based Features:** Pad Definition, Drafted Filleted Pad Definition, Pocket Definition, Drafted Filleted Pocket, Shaft Definition, Groove Definition, Hole Definition
- Creating Reference Element: Plane Definition

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Session 4:

- **Creating Sketch-based Feature:** Rib Definition, Slot Definition, Stiffener Definition, Solid Combine Definition
- **Applying Dress-Up Features:** Edge Fillet Definition, Variable Fillet Definition, Chordal Fillet Definition, Face-Face Fillet Definition, Tritangent Fillet Definition, Chamfer Definition

Software: CATIA

Duration: 40 HRS

Session 5:

- **Creating Sketch-Based Features:** Multi-Sections Solid Definition, Removed Multi-Section Solid
- **Applying Dress-up Features:** Draft Definition, Draft Reflect Line Definition, Variable Angle Draft Definition, Shell Definition, Thickness Definition, Thread/Tap Definition, Remove/Replace Face Definition
- **Creating Surface-Based Features:** Split Definition, Thick Surface Definition, Close Surface Definition, Sew Surface Definition

Session 6:

- **Creating Reference Element:** Point Definition, Line Definition
- **Creating Transformation Features:** Transformation Definition, Rotation Definition, Symmetry Definition, Axis to Axis Definition, Mirror Definition, Pattern – Rectangular/ Circular Pattern Definition, Scale Definition

Session 7:

- **Introduction to Assembly Design:** Understanding Top Down & Bottom Up Approach
- **Understanding Product Structure Tools:** New Component, New Product, New Part, Existing Component, Existing Component with Positioning
- **Understanding Constraints Toolbar:** Coincidence Constraints, Contact Constraints, Offset Constraints, Angle Constraints, Fix Component, Fix Together, Quick Constraint, Flexible/Rigid Sub-Assembly, Change Constraint, Reuse Pattern

Session 8:

- **Introduction to Sheet metal Design:** Understanding Sheet metal Parameters
- **Understanding Views Toolbar:** Fold/Unfold, Multi viewer, Views Management
- **Creating Walls:** Wall, Wall on Edge, Extrusion, Swept Walls- Flange, Hem, Tear Drop, User Flange
- **Creating Rolled Walls:** Hopper, Free from Surface, Rolled Wall
- **Understanding Bending Operations:** Bend / Conical Bend, Bend from Flat, Unfolding/ Folding, Point or Curve Mapping
- Recognize Definition

Session 9:

- Wireframe and Surface Design, Introduction to Surface Design
- **Understanding Wireframe Toolbar:** Point, Point and Planes Repetition, Line, Axis, Polyline, Plane, Planes Between, Projection, Intersection, Circle, Corner, Connect, Spline, Helix
- **Creating Surfaces:** Extruded Surface Definition, Revolution Surface Definition, Sphere Surface Definition
- Trim & Split Definition
- **Creating Surfaces:** Cylinder Surface Definition, Offset Surface Definition, Fill Surface Definition, Multi-Sections Surface Definition, Blend Definition
- **Creating Sweep Surface:** Swept Surface Definition using profile type - Explicit, Line, Circle, Conic

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Software: CATIA

Duration: 40 HRS

Session 10:

- Introduction to Drafting
- Creating New Drawing File
- **Creating Projection Views:** Front view, Un folded view, View from 3D, Projection, Auxiliary, Isometric, Advanced Front view
- **Creating Sectional Views:** Offset Section view, Aligned Section view, Offset Section Cut, Aligned Section Cut
- **Creating Details Views:** Detail, Sketched Detail Profile, Quick Detail, Sketched Quick Detail Profile
- **Creating Dimensions Using:** Dimensions, Chained Dimensions, Cumulated Dimensions, Stacked Dimensions, Length Dimension, Angle Dimension, Radius Dimension, Diameter Dimension,

_____End_____

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Software: NX CAD

Duration: 40 HRS

Session 1:

- Introduction to Unigraphics NX , About NX Gateway, Getting Started
- **NX Graphical User Interface:** Title bar, Menu bar, Toolbar, Radial toolbar, Selection bar, Cue and status line, Dialog rail, Resource bar, Navigators, HD3D tools, Integrated browser, Palettes, Roles, Full screen, View orientation- trimetric, isometric, View commands, Rotate ,Pan, Zoom in/out, Quick pick, Quick pick, categories, Coordinate system- absolute coordinate system, WCS, Absolute coordinate, Work coordinate system. View triad, Multiple graphics window, Information window, Keyboard accelerators, Dialog box
- **File management:** Creating new files and about templates, Opening files, Saving files

Session 2:

- **Creating Sketches:** Profile, Line, Arc, Circle, Fillet, Chamfer, Rectangle, Polygon, Studio Spline, Fit spline, Ellipse, Conic.
- **Editing sketches:** Quick trim, Quick extend, Make corner, Offset curve, Pattern curve, Mirror curve, Intersection point, Derived lines
- **Constraints:** Geometric constraints, Auto constraint, Inferred constraint, Dimensional constraints, Auto dimension, Animate dimension, Continuous auto dimension

Session 3:

- **Basic terminologies:** Feature, Body, Solid body, Sheet, Face, Section curves, Guide curves
- Feature modeling concepts
- About Datum CSYS and Datum Planes
- Changing units in NX
- Creating Extrude features
- Creating Revolve features
- Revolve sketch about an axis
- Creating Datum Features: Datum Plane, Datum axis, Datum CSYS, Datum Point

Session 4:

- Creating Sweep Features
- Blend Features
- Applying Chamfer

Session 5:

- **Hole:** General hole, Drill size holes, Screw clearance holes, Threaded holes
- Boss
- **Pocket:** Cylindrical, Rectangular, General
- **Pad:** Rectangular, General
- **Emboss:** Offset emboss

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Software: NX CAD

Duration: 40 HRS

- **Slot:** Rectangular, Ball end, U-Slot, T-Slot, Dove tail
- **Groove:** Rectangular, Ball end, U-groove, Dart, Thread, Shell
- **Draft:** From plane, From edges, Tangent to faces, To parting edges, Draw direction, Variable draft points

Session 6:

- **Instance feature:** Rectangular array, Circular array, Pattern face
- Mirror feature, Mirror body
- **Instance geometry creation:** From bodies, From faces, From faces, From edges, From curves, From points
- Exercises included for practice

Session 7:

- Assembly Constraints
- Angle, Bond, Centre, Concentric, Distance, Fit, Parallel, Perpendicular, Touch align
- Creating component arrays
- Linear array, Circular array, Feature instance array
- Assembly Modeling
- Moving a component, Creating exploded views,
- Exercises included for practice

Session 8:

- Introduction to drawing
- Inserting new sheets, Editing sheets
- Setting up standards, Knowing Graphical User Interface of drafting, NX drafting methods
- Creating drafting views
- Base view, Drawing view, Projected view, Orthographic view, Auxiliary view, Detail view
- **Section view:** Simple section, Stepped section
- **Adding dimensions:** Inferred Dimension, Horizontal Dimension, Vertical Dimension, Parallel Dimension, Perpendicular dimension, Angular dimension, Cylindrical Dimension, Hole dimension, Diameter Dimension, Chamfer Dimension, Radius or Radius of Curvature Dimension, Radius to Centre

Session 9 &10:

- Surface Modeling commands
- Creating extrude surface
- Creating revolved surface
- Creating ruled surface
- Surface by Through curves, Surface by Through curve mesh
- Creating Studio surface

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Software: NX CAD

Duration: 40 HRS

Surface from Section Surface

Surface creation by N-Sided surface

Sheet metal Design

About NX Sheet Metal Preferences

Creating base feature, Tab

Creating Bend feature

Attaching flange, Attaching Contour flange, Creating Lofted flange, Inserting Hem flange, Apply Bend, unbend, re bend, Apply Jog, Creating Sheet metal from solid

Corner definition

_____End_____

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Software: NX CAM Essential

Duration: 40 HRS

SESSION 1: INTRODUCTION TO MANUFACTURING & NX-CAM

- Introduction to manufacturing
- About manufacturing types
- About machining types
- Milling operations overview
- Introduction to CAM
- Benefits of CAM
- Introduction to NX CAM
- Benefits of NX CAM
- Milling overview
- About Conventional milling and Climb milling
- Milling machines overview
- Milling cutters overview
- Manufacturing in NX
- Understanding CAM terminologies
- About machining environment
- Understanding CAM set up
- About CAM configuration
- About NC assistant
- About Milling processors and operation sub types
- Exercises included for practice

SESSION 2: NX-CAM TOOLS

- **Operation** Navigator: Operation Navigator overview, Operation status symbols, Editing Operations, Transform Operations
- **Geometry Groups**: Geometry Groups overview, MCS overview, In Process Work piece, Assigning material to part
- **Tool Groups**: About milling tool types, About tool holder, Retrieving Tools from Tool Library
- Program and Method Groups: About Program groups, About Method group creation, Defining Feed rates
- **Visualize and Analyze:** Understanding Tool Path Visualization, Understanding Visualization Replay, Understanding Dynamic Visualization, Understanding IPW thickness by color, About Gouge Checking , About Generating Tool Paths, Parallel Generate overview, Verify Tool Path overview, About Installation of Postprocessor, Generating program using Post process, Generating Shop Documentation
- Exercises included for practice

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Software: NX CAM Essential

Duration: 40 HRS

SESSION 3: MILLING OPERATION - I

- **Facing Milling Operation:** Introduction to Face Milling operation, Specifying Check bodies, Specifying face boundaries, Defining Path Settings, Defining Stopover, Defining Cut Patterns, Creating Face Milling Area Operation, Defining Cut Walls, Defining Mixed and Manual Cut, Patterns, Post process a program, Generating Shop Documentation
- **Planar Milling Operation:** Introduction to Planar milling operation, Specifying part geometries, Stock overview, Defining Non cutting moves, Defining Transfer/Rapid
- Exercises included for practice

SESSION 4: MILLING OPERATION - II

- Planar Profile Operation
- Creating Planar Profile Operation
- Planar Milling Operation
- Planar Operation using Standard Drive cut pattern
- Planar Text Operation
- Creating Planar Text Operation
- Thread Milling Operation
- Creating Thread Milling Operation on Hole and Boss feature
- Contour Milling Operation
- Creating Cavity Milling Operation
- Defining Wave Geometry Linker
- Defining Trochoidal cut pattern
- Machining based on level based IPW
- Exercises included for practice

SESSION 5: MILLING OPERATION - III

- Rest Milling Operation
- Creating Rest Milling Operation
- Defining Cut levels
- Z-level Milling Operation
- Creating Z Level Milling Operation
- Defining Containment for blank
- Creating Additional Passes
- Defining Step over in Path Settings
- Surface Contouring Operation
- Creating Contour Area Non Steep Operation
- Milling Operation based on Area Drive method

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Software: NX CAM Essential

Duration: 40 HRS

- Creating Contour Area Operation
- Defining Cut Direction
- Editing Tool display
- Defining Trim Boundary
- Specifying Cut Angles
- Specifying Directional Steep
- Exercises included for practice

SESSION 6: RADIAL CUT OPERATION

- Creating Fixed Contour Operation
- Defining Radial Drive method
- Editing Band Parameter
- Engraving Text on Contour Surface
- Creating Contour Text Operation
- Exercises included for practice

SESSION 7: VARIABLE CONTOUR OPERATION

- Creating Variable Contour Operation
- Defining Normal to Drive method
- Creating Variable Contour Operation using Normal to Part Tool Axis method
- Defining Projection Vector and Tool Axis
- Defining Lead Angle
- Creating Variable Contour Operation using Interpolated Tool Axis vectors
- Interpolating Tool Axis
- Exercises included for practice

SESSION 8: MULTI BLADE MILLING OPERATION

- About Turbo machinery Milling Operation
- Creating Multi Blade Roughing Operation
- Specifying Hub geometry
- Specifying Shroud geometry
- Specifying Blade geometry
- Specifying Blend geometry
- Defining Drive Methods
- Defining Cut Levels
- Creating Multi Blade Hub Finish Operation
- Creating Multi Blade Finish Operation
- Exercises included for practice

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Software: NX CAM Essential

Duration: 40 HRS

SESSION 9: DRILLING OPERATION

- About Drilling machines
- About Drilling tools
- About Drilling tool material
- Various Drilling operations
- Operation sub types in Drilling Operation
- Defining Drill geometry
- Creating Spot Drilling Operation
- Creating Drilling Operation
- Creating Counter Boring Operation
- Creating Reaming Operation
- Creating Peck Drilling Operation
- Creating Boring Operation
- Creating Counter Sinking Operation
- Exercises included for practice

SESSION 10: TURNING OPERATION

- About Lathe machines
- Various tools available for Turning Operation
- Operation subtypes in Turning Operation
- About Part geometry
- About Blank geometry
- About Avoidance
- About Cut Region Containment
- Defining Turning Work piece
- Defining Trim Planes

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CADD CENTRE

Electric Vehicle Technology and Operations

Duration: 24 Hrs (12 Sessions)

Lesson 1: Introduction to Electric Vehicle

- Introduction to EV and History of EVs
- Benefits and Challenges of EVs
- Socio – Economic impact of EVs
- Renewable Energies
- Technology Challenges and Types of EVs
- EV System Architecture
- Major Systems – EV Architecture

Lesson 2: Vehicle Dynamics

- Introduction to Vehicle Dynamics Modeling for Electric Vehicles
- Major terminologies
- Vehicle Movement
- Vehicle Resistance
- Dynamic Equation
- Tire Ground Adhesion and maximum tractive effort

Lesson 3: EV – Propulsion System

- Introduction
- Types of Electric Motors
- DC Motors
- AC Motors
- The Motor Controller
- Power Converter

Lesson 4: EV – Energy Source System

- Introduction to Chemical Energy and Bonding
- Introduction to Chemical Energy and Thermodynamics
- Introduction to Electrochemistry
- Energy Sources
- Charging of EV
- Vehicle-to-Grid (V2G)
- Energy Management System

Lesson 5: Auxiliary Systems and Sensors

- Introduction to Auxiliary systems
- Power Steering Unit
- Air conditioning Systems
- Auxiliary Power Unit(APU)

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- CAN Bus Communication Control
- Sensors

Lesson 6: MATLAB Fundamental

- Introduction to MATLAB
- MATLAB Built-In functions
- Programming & MATLAB Scripts
- Examples Based on Electrical Vehicle(EV)
- Introduction to Model -Based Design
- Modeling, Simulation, and Analysis with Simulink
- Basic Modelling Workflow
- Basic Simulation Workflow
- Examples

Lesson 7: Technologies driving future EVs

- Charging : Wireless charging of EV
- Charging : On-road charging of EV
- Charging : Solar powered EVs
- Battery: Battery swap technology

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Skills Driven, Job Led

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Skills Driven. Job Led

EV Battery Technology and Design

Duration: 40 Hrs (28 Hrs Theory + 12 Hrs Practical)

Lesson 1: Introduction to Energy and Batteries

- Basic chemistry and physics of energy
- Renewable energy and non-renewable energy
- Energy conservation system
- Invention of battery
- Later development and uses

Lesson 2: EV Batteries

- Battery types
- Principle and operations of rechargeable batteries
- Battery terminology
- Battery performance
- Battery materials
- Form factor of batteries

Lesson 3: Battery Modeling

- Battery cell modeling
- Battery pack
- Battery state estimation
- Battery range calculation

Lesson 4: Battery Management System (BMS)

- Battery Management System(BMS)
- BMS Design Considerations
- General Functions of BMS

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- Specific Functions of BMS
- Testing

Lesson 5: Packaging and Safety

- Battery packing
- Safety measurements in battery

Lesson 6: Introduction to SMART Battery and HIL

- Smart Battery
- HIL system

Lesson 7: Modelling of cell and battery

- Mechanical model input
- Electrical model input
- LI –ion battery charging model

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Software/Topic: 3DS Max Essential

Duration: 40 HRS

INTRODUCTION TO MAX

- **Design Harmony** : Max for Architects
- Autodesk 3ds Max
- **Terminologies** : Modeling, Lights and Cameras, Animation, Rendering
- The Welcome Screen : Learn Tab, Start Tab, Extend Tab
- Layout Panel
- **3ds Max Interface:** Elements of GUI, Application button and Quick Access toolbar, Info Centre , Menu bar, Main toolbar, Ribbon, Scene Explorer, Viewport Layout ,Command panel ,Viewports , Animation and Time controls, Viewport Navigation controls
- **Quad Menu** : Transform Quadrant, Display Quadrant
- **Tools Menu** : Display Floater, Array, Align, Snapshot, Color Clipboard Utility

SHAPES AND GEOMETRY

- **Spline:** Line, Rectangle, Circle, Ellipse Spline, Arc Spline, Donut Spline, NGon Spline, Star Spline, Helix Spline, Egg Spline, Section Spline, Extended Splines, WRectangle Spline, Channel Spline, Angle Spline, Tee Spline
- **Standard Primitives:** Box, Cone, Sphere, GeoSphere, Cylinder, Tube, Torus, Pyramid, Teapot, Plane, TextPlus
- **Extended Primitives**: Hedra, Torus Knot, Chamfer Box, ChamferCyl, Oil Tank, Capsule, Spindle, L-Ext, Gengon, C-Ext, Ring Wave, Prism, Hose,
- **Compound Objects:** Morph, Scatter, Conform, Connect, BlobMesh, Shape Merge, Boolean, Terrain, Loft, Mesher, ProBoolean, ProCutter
- **Patch Grids:** Quad Patch, Tri Patch
- **NURBS Surfaces:** Point Surface , CV Surface
- **Doors:** Pivot Door, Sliding Door, BiFold Door
- **Windows:** Awning Window, Casement Window, Fixed Window, Pivoted Window, Projected Window, Sliding Window
- **AEC Extended:** Foliage, Railing, Wall
- **Stairs:** Straight Stair, L - Type Stair, U-Type Stair, Spiral Stair
- **Dynamics Object:** Spring, Damper
- **Space Warp Objects:** Gravity, Wind ,Displace

MODIFIERS

- **Selection Modifiers:** Mesh Select Modifier, Patch Select modifier, Poly Select Modifier
- Editable Poly
- **Vertex:** Remove, Break, Extrude, Weld, Chamfer, Target Weld
- **Edge:** Remove, Split, Extrude, Weld, Chamfer, Target Weld, Bridge, Connect

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Software/Topic: MAX Essential

Duration: 40 HRS

- **Border:** Extrude, Insert Vertex, Chamfer, Cap, Bridge, Connect
- **Polygon/Element:** Insert Vertex, Extrude, Outline, Bevel, Inset, Bridge, Flip
- **Object – Space Modifiers:** Bend Modifier, Lattice Modifier, Push Modifier, Shell Modifier, Stretch Modifier, Twist Modifier, Lathe Modifier, Wave Modifier, Smooth Modifier, TurboSmooth Modifier, Symmetry Modifier, Cloth Modifier, Simulation Parameters (Cloth)
- FFD (Free Form Deformation)

MODELING INTERIOR & EXTERIOR OBJECTS

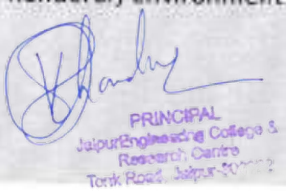
- Detailed Modeling of a Kitchen Cabinet
- Modeling the Objects for Living Room
- Modeling the Exterior of a Building
- Environment Modeling

MATERIALS

- Material Editor
- **Compact Material Editor:** Get Material, Put Material to Scene, Assign Material to Selection, Reset Map/Mtl to Default Settings, Make Material Copy, Make Unique, Put to Library, Material ID Channel flyout, Show Shaded/Realistic Material in Viewport flyout
- Show End Result, Go to Parent, Go Forward to Sibling
- **Slate Material Editor:** Menu bar, Toolbar, Material/Map Browser, Status, Active View, View navigation, Parameter Editor
- **UVW Coordinates:** Coordinates Rollout (2D), Coordinates Rollout (3D), Camera Map Modifier (World Space)
- **UVW Map Modifier:** Manipulators for UVW Map
- Composite Material
- **Defining Material for Exterior Model**

LIGHT, CAMERA AND RENDERING

- Lights
- **Photometric Lights:** Target Light, Free Light, Mental Ray (mr) Skylight Portal, Sun Positioner
- **Standard Lights:** Target Spotlight, Free Spotlight, Target Directional Light, Free Directional Light, Omni Light, Skylight, mr Area Omni Light, mr Area Spotlight
- **Cameras:** Physical Camera, Free Camera, Target Camera, Walkthrough Assistant
- **Rendering:** Render Setup Dialog, ART Renderer, Scanline Renderer, Mental ray Renderer, Environment and Effects Dialog Box
- Exposure Controls



Software/Topic: MAX Essential

Duration: 40 HRS

- Exterior Lighting
- Environment Texturing
- Exterior Rendering

ANIMATION & FILE MANAGEMENT

- Saving and Loading Animation, Animation Layers (Layer Controller),Enabling Animation Layers, Animation and Time Controls, Integrating Animation Layers in Workflow, Time Configuration
- **Animation Quad Menu:** Set quadrant, Pose quadrant, Transform quadrant
- Animation Constraints, Wire Parameters, Position/Rotation/Scale Controller, Video Post
- Day Light Shadow Animation
- Chess Animation
- **File – Handling:** New, Save, Merge, Manage, Properties, Exit
- Merging Files
- About the Print Size Wizard
- Project Worksheet

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Software: LUMION

Duration: 40 HRS

Session 01: Getting Started with Lumion

- Why use Lumion?
- Lumion 8 features for elevating render beauty to new heights
- **Simulate daylight with Sky Light**: Sky Light's impact on exteriors, Sky Light's impact on interiors
- Highlight every detail with Soft and Fine Detail Shadows
- **Concept rendering with the hand-drawn Outlines effect**: Watercolor Style
- Instant smooth edges with the edges slider
- What can we get from Lumion?
- **Importing 3D models**: 3D formats,2D formats, Video formats
- Workstation specifications
- Starting to work with Lumion: A quick overview
- **Lumion's 3D interface**: Start tab, Examples tab, The Load scene tab, Save scene tab
- Camera navigation in Lumion, Exploring the interface and controlling the camera
- Weather menu, Landscape menu, Materials menu, Objects menu, Photo menu, Movie menu, Panorama menu, Build menu, Files menu, Settings menu, Help menu and Lumion's layers menu

Session 02: Importing and Handling 3D Models

- Importing 3D models
- **Import New Model:** Select object, Importing SketchUp files
- **Re-Import Model:** Method 1: *Build Mode*, Rearranging 3D models
- **Place mode tools:** Move object, Size object, Change height, Rotate, Change the value in Orientation (⊞) menu and Using Hotkeys
- Placing 3D model accurately
- Move mode menu tools
- Common problems and solutions
- Reversed or missing faces

Session 03: Applying and Creating Materials

- Material or texture, A quick overview of Lumion's materials, Assigning materials to a 3D model
- **Modifying and tweaking Lumion's materials:** Scale, Colorization, Reflection, Glossiness and more
- **Controlling the refection sharpness:** Gloss, Reflectivity, Relief, Normal map direction, After - Flip normal direction
- **Expanded Settings:** Position tab, Orientation tab, Transparency tab, Settings tab, Weathering tab, Foliage tab

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Software: LUMION

Duration: 40 HRS

- **Custom materials:** Working with the Glass material, Hiding geometry with the Invisible material,
- Creating swimming pools and other water surfaces, Using the fantastic Water material, Exploring the Waterfall material, The Standard material
- The mysterious Advanced Options menu
- **How do Normal Maps work in Lumion:** Using the Normal Map generator, Using Normal Maps from 3rd party applications
- **Copy, Paste, Save and Load materials in Lumion**: Copy/pasting a Material, Loading/saving a Material to a file, Copy/pasting Extended settings, Loading/saving a Material Set to a file

Session 04: Creating an Exterior Scene with Lumion

- Planning your scene, Sculpting the terrain, Lumion's sculpting tools
- **Shaping the terrain with the Height submenu:** Brush Size setting, Brush Speed setting, The Undo button, Using a graphic tablet to sculpt, Working with the Terrain submenu, Flatten terrain map, Toggle rock on/off
- Using terrain or height maps
- **Creating a height map**: Using Adobe Photoshop and GIMP, Using an external application
- Creating height maps for real locations
- **Modeling a 3D terrain**: The Landscape material, Water material
- **Water submenu**: Place object, Move Object, Delete Object
- Ocean submenu
- Scattering elements with the Grass submenu, Choosing the landscape with the Paint submenu
- Working with Open Street Map in Lumion
- **Using Lumion's layers**: Why use layers?, Where is the Layers menu?, How layers work in Lumion

Session 05: Creating Your 3D World

- Different categories and what we can find, Idle, animated, and other 3D models
- **Placing a 3D model from Lumion's library:** Placing multiple copies with one click, Random size when placing models
- Tweaking the 3D models
- **Controlling the models:** Copying 3D models, Selecting and deleting 3D models
- **Context menu:** Select in library, Replace with library selection
- **Selection options:** Select identical objects, Select All Objects in category, Selecting different categories
- **Controlling 3D models with the Transformation submenu:** Lock Position, Place on ground, Reset size rotation, Same rotation, Randomize, Space XZ, Align
- Editing the properties of a 3D model: Control Tree properties dialog box

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Software: LUMION

Duration: 40 HRS

Session 06: Lighting in Lumion

- Lumion lighting – a quick overview, Adjusting the Weather menu, Exterior lighting with the Weather menu
- Photo and Movie modes – a very quick introduction
- **How to create a golden and blue hour**: Blue hour, Golden hour
- Creating a golden and blue hour with the Sun effect
- Adding realistic clouds using the Cloud effect
- **Interior lighting with Lumion's lights:** Spotlights, Omni Lights, Fill Light, Area and Line Lights, Light source
- Working with Global illumination
- **Utilities**: Improving reflections with a reflection cube

Session 07: Creating Realistic Visualizations

- Special effects—fire, smoke, and fog
- **Special elements:** Fire – a practical example, Smoke, Fog
- Photo and Movie effects, What are the effects and how can they help me?, Things needed for this chapter
- **Visualize your conceptual designs in Lumion 8**: Instant conceptual renders with the Styles button, Water color style, Color Sketch
- The difference with using the Movie mode
- Sun study – what is it and how can it be useful, Change Style, Add effect
- Tweaking shadows using the Shadow effect
- Working of shadows in Lumion, Correcting shadows, Colouring and tweaking soft shadows
- Creating realistic reflections, Improving the realism with Camera effects, Camera effects – what are they and how to use them, Depth of field, Creating lens artifacts with the Lens Flare effect
- Balancing the Bloom effect with the Exposure effect, Noise, Changing the saturation with the Selective Saturation effect, Color correcting in Lumion
- Adding vignette, Lens' errors – chromatic aberrations, A practical application for the God Rays effect, Working with Horizon, Volume Clouds
- Render still Images with the Photo mode, How to control the effects

Session 08: Non-photorealistic Visualizations with Lumion

- Non-Photorealistic Rendering, Benefits of using NPR's illustrations, How can Lumion help us?
- Moving, deleting, and hiding effects
- How to use the artistic effects, Conceptual visualization with the Painting, Watercolour, and Sketch effects

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Software: LUMION

Duration: 40 HRS

- The first layer – the Painting effect, The first layer – the Watercolour effect, The second layer – the Sketch effect
- **Technical illustrations with the Manga and Cartoon effects**: Correcting perspective with a 2-point perspective, Exploring and using the Manga effect, Working with the Cartoon effect
- **How to use the Outlines effect and Lumion's other artistic options**: Pastel Sketch, Oil Painting, Blueprint
- **Breaking down a concept render**: Watercolor, Outlines, Analog Color Lab

Session 09: Animation Techniques

- Lumion's Movie mode – a quick overview, Motive and the need to create a storyboard, Lumion's Movie mode – the workflow
- **Step 1 – Shoot the movie**: Creating a camera path, The camera path – how it works, Best practices – creating a smooth camera path, Composition and its importance, Composition, Importance of composition, Getting a good composition
- **Step 2 – Editing the clips**: Editing a camera path, Changing the video length,
- Camera-filming techniques, Tracking
- **Step 3 – Organizing the movie**: Handling clips, Renaming clips, Deleting and controlling multiple clips, How can we move and rearrange the clips?
- **Step 4 – Animating objects and effects**: Lumion's animation effects – a quick overview, Animating layers with the Hide and Show layer effects, Sky drop with Lumion, Animating a section cut with the Near Clip Plane effect, Keyframe, Simple animations with the Move effect, Animating curved paths with the Advanced move effect

Session 10: Creating Walk-through Visualizations

- Lumion's video effects – a quick overview, The Entire Movie mode
- Two exclusive effects – Side By Side 3D stereo and Sound effect, Best practices – copying effects from the Photo mode
- **Improving the movie using additional effects:** Using depth of field and animating the camera's focus, Adding realistic motion blur, Walking and handling the camera, Visual effects – Rain, Snow, and much more, Winter time with the Snow and Rain effects
- **Small details with Lumion effects**: Water effect, Contrails effect, Wind effect, A special touch with falling leaves
- Enriching the movie using sound, Playing safe with the Broadcast Safe effect
- **Final touches using the Titles and In/Out effects**: Fading in/out – transitions between clips, Adding text and logos with the Titles effect
- **Rendering the final movie**: Exporting an entire movie, Exporting individual clips, Rendering a sequence of images, Render passes

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Software: V Ray

Duration: 40 HRS

Session 1 & 2:

- **Introduction:** Introduction to Vray, Highlights of Vray and understanding the Graphical user Interface, understanding the Vray Frame Buffer
- **Vray Rendering Engines:** Understanding the Rendering, Understanding the Production Rendering mode and Real-Time Rendering Mode
- **Vray Image Sampling:** Understanding the concept of Image sampling, Understanding the antialiasing quality and shading quality. Controlling the quality of Interior and Exterior renderings using Render Settings.

Session 3:

- **V-Ray Lights:** Introduction to Lighting concept, Understanding the Vray Area lights and its various types and options for interior renderings, Vray Lights and 3ds Max Lights, Understanding the Vray Ambient Lights, Vray Dome Light and its various settings, Creation of Vray IES Light and its various settings, Understanding the Sun and Sky Light and its various settings for exterior renderings.

Session 4 & 5:

- **GI for Exterior and Interior Scenes:** Introduction to GI Concept, Understanding the various rendering engines for primary and secondary engines, Understanding the GI settings for Exterior Scenes using various rendering engines, Understanding the GI settings for Interior scenes using various rendering engines
- Understanding the GI for Quick Animation renderings and its various options, Concept of Caustics effects, Understanding the Settings and options in Lights and render setup for Caustics effect and creation of caustics effects

Session 6 & 7

- **Vray Physical Camera:** Introduction to Camera, Understanding the various settings and options in Vray Physical Camera, Controlling Exposure using Camera settings, understanding the Depth of Field effect and settings in Vray Physical Camera, Creation of Depth of Field Effect. Understanding the Motion Blur effect, creation of Motion Blur using Vray Physical Camera.
- **Vray Materials:** Introduction to Vray Materials, Creation of Vray Materials, understanding the Diffuse and Roughness parameters in Vray Materials, Understanding the Reflection property of a material and its various settings & creation of reflective materials, understanding the refraction property of a material and creation of refractive materials and various its various settings, Understanding the Translucent Property and creating Translucent materials using its various options, Understanding the Bump and normal mapping, Creation of Textured Metals and Brushed Metals using Maps.

Session 8 & 9:

- **Vray Aerial Perspective:** Introduction to Vray Aerial perspective, Understanding the various options available in Vray Aerial Perspective Mode and creating the Aerial Perspective View. Understanding the Vray Environment Fog Effect and its various settings, Creation of Vray Environment Fog Perspective effect
- **Vray Displacement MOD:** Introduction to Displacement Mod and its various types, Understanding Vray Proxy and creation of Vray Proxy, Concept of Vray Instancer and creation of Vray Instancer, Understanding the Vray Fur concept and its various options, Creation of Vray Fur.

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Software: V Ray

Duration: 40 HRS

Session 10

- **Vray Render Elements**: Introduction to Render Elements, Understanding the purpose of various render elements and its options and Final Rendering process. Understanding the compositing process using Photoshop. Understanding the Beauty pass concept and final rendering in Photoshop.

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Software: STAAD.Pro

Duration: 40 HRS

Session 1:

- Overview of Structural Analysis and Design
- Overview to STAAD Pro Connect Edition
- Overview of Fundamentals
- GUI
- Creating and opening a new file
- Unit System & Coordinate system
- Navigation & Mouse Controls
- STAAD Editor

Session 2:

- Grids & Types of Grids
- **Node Creation:** Snap Node, Node table, at overlapping beams, Insert Node for single and multiple members, using STAAD Editor.
- **Beam Creation:** Snap beam, using beam layout, connect beams along, Point to Point, Between Midpoints, Perpendicular Intersection, Curved Member and using STAAD Editor.
- **Structure Wizard:** Units, creating truss, creating frame, creating continuous beam, creating cylindrical frame and beam model, Editing parameters, Transferring the model to STAAD Pro, adding items to the library.

Session 3:

- Select Menu
- **Model Editing Tools for beam:** Split, stretch, break, Merge, Renumber and Move
- **Model Editing Tools for node:** Move, Merge & Renumber
- Translational Repeat
- Circular Repeat
- Mirror
- Rotate
- View Tools

Session 4:

- Material Specification
- Section Profile Specification
- Member Orientation
- Member Specification: Axial Actions, Member end release, Member Offset
- Support Specification
- Group Specification

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Software: STAAD.Pro

Duration: 40 HRS

Session 5:

- Creating a Primary Load, Adding Self weight
- Nodal Load
- **Member Load:** Uniform Force and Moment, Concentrated Force and Moment, Linear Varying Load, Trapezoidal Load, Hydrostatic Load, Pre/Post Stress
- Area Load
- Floor Load

Session 6:

- **Wind Load:** Defining Wind Load, Wind Load case
- **Load Combination:** Defining Load Combinations, Automatic Load Combination, Edit Auto Combination Rules
- Introduction to Analysis

Session 7:

- Introduction to FEM
- **Plate Generation:** 3 or 4-noded 2D plates, Surface objects with holes
- **Add Plate:** Triangular plate, Infill plates
- **Generate Meshing:** Plate Meshing, Surface Meshing
- **Solid Generation:** Solid 3D bricks from 4 to 8-noded
- Composite Decks
- Structure Wizard: Surface, Plate & Solid Models
- Property Specification: Thickness

Session 8:

- **Plate Load:** Pressure on Full Plate, Concentrated Load, Partial Plate Pressure Load, Trapezoidal Load, Hydrostatic Load
- Element Joint Load,
- Moving Load
- Reference Load & Repeat Load

Session 9:

- Batch Design Vs Interactive Design
- Concrete Design in STAAD.Pro: Column Design, Beam Design

Session 10:

- Steel Design in STAAD.Pro
- Design of Overhead Transmission Line Towers. **Report Generation**

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Software: MX Road Essential

Duration: 40 HRS

SESSION 1:

- Introduction: MXROAD key features
- Basic concepts
- Getting started: Create new project, Working environments
- CAD Environment
- View controls in MX
- CAD tools
- Exercises included for practice

SESSION 2:

- Enhanced menu and GUI changes
- **Survey inputs and validation:** General procedure (GENIO file)
- **String names and drawing styles:** Feature name sets, Drawing produced by plan style sets, Displaying the model, Hiding or deleting MX graphical elements
- **Survey input:** Google earth, (ASCII format) Excel
- Exercises included for practice

SESSION 3:

- **Status:** Deriving information from display - Point related, Point selection methods, Distance/ dimension related
- **Model analysis:** Triangulation, Data conflicts, Surface checker
- Exercises included for practice

SESSION 4:

- **Edit models:** Create model, Delete a model, Free/secure a model, Rename a model, Trim a model to a boundary, Create composite model
- **Edit strings:** Create string dynamically, Create string
- **Surface Analysis:** Performing surface analysis
- String Naming Convention
- Exercises included for practice

SESSION 5:

- **Design - quick alignment:** Alignment, Horizontal design, Horizontal design toolbar, Report
- **Design -Vertical profile:** Design model, Existing model, Collinear profile model, Vertical profile toolbar
- Exercises included for practice

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Software: MX Road Essential

Duration: 40 HRS

SESSION 6:

- **Design- alignment by element method:** Begin horizontal design, Horizontal alignment -Element method
- **Best fit alignment:** Best fit horizontal alignment- Element, Best fit alignment- vertical string
- Exercises included for practice

SESSION 7:

- Road design- carriageways
- Rule based super elevation
- Cross fall checker
- Road design- road widening
- **Dynamic reports:** Types of reports, Adding annotation, Saving report
- Exercises included for practice

SESSION 8 &9:

- **Junction design:** Create fillet, Regrade junction, Traffic island, Tidy junction
- Road design- shoulder design
- Road design- kerbs, verges and footways
- **Earthwork design:** Earthwork model details, Assign Earthwork Style and Strategy, Earthwork style open, Alternative strategy, End earthworks
- Exercises included for practice.

SESSION 10:

- **Pavement and subgrade design:** Model details, Pavement layer design, Pavement layer design- Style set, Pavement styles –Areas and Zones, Reports
- **Final Drawings Manager:** Create cross sections, Display cross sections, Layout pages, Page setup, Create or edit page setup, Page layout, Edit page layout, Annotate drawing, Publish drawings
- Exercises included for practice

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Synergy
SCHOOL OF BUSINESS SKILLS

Primavera For Institutional (32hrs)

Session	Topics
Session1	**Introduction to Project Management**
	Project and Project Management
	The Purpose of Planning
	Project Planning Metrics
	Introduction to Primavera
	About Primavera
	P6 EPPM Suite.
	Data Structure of Primavera
	Projects
	About Projects.
	Creation and opening a Project
Session 2	**Calendar**
	Introduction to Calendar
	Types of Calendars
	Creating global calendars, Project and Resource Calendars
	Editing the standard work weeks & its time.
	Create Exception.
	Work Breakdown Structure
	Introduction to WBS
	WBS Structure
	Creation of WBS
	Activities
	Introduction about an Activity
	Creating Activities
	Delete an activity.
Session 3	**Relationship**
	Introduction about Relationship
	Types of Relationship
	Dissolve Activity
	Apply Lead or Lag
	Views
	Scheduling
	Introduction about Scheduling
	About Critical Path Method
Session 4	**Constraints**
	Introduction about Constraints
	Types of Constraints
	Procedure to apply constraints
	Resources
	Introduction about Resources
	Types of Resources.
	Define Resources in various methods
	Assigning a Resource
	Assigning Resources to an Activity
	Reports
	Introduction about Reports
	Types of Reports & Procedure to Take Reports

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Software: Ansys Civil Essential

Duration: 40 HRS

SESSION 1

- Introduction
- Structural Engineering
- FEM
- ANSYS + CivilFEM
- CivilFEM Setup
- Element Type – Beam
- Material Explorer
- Cross Section Explorer
- Beam Property

SESSION 2

- Modelling in ANSYS
- Keypoint
- Lines
- Mesh
- Node
- Element
- Merge
- Work Plane
- Coordinate System

SESSION 3

- Loads
- Displacement
- Inertia
- Pressure
- Force / Moment
- Solve
- Civil Post processing
- Preparing Shear force, Bending Moment, Axial Force, Deflection and Support Reaction results

SESSION 4

- LS Files
- Load Combination
- Concrete Design
- Assigning reinforcement for a beam and column

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Tonk Road, Jaipur-302022

Software: Ansys Civil Essential

Duration: 40 HRS

- Plane Frame Design
- Space Frame Design

SESSION 5

- Modelling
- Area
- Boolean
- Mesh Mapping
- Slab Design

SESSION 6

- Prestressed Concrete Design
- Creating Tendons
- Loading Tendons
- Customising Beam Cross Section
- Cross Section Explorer: Merge
- Cross Section Explorer: Capture

SESSION 7

- Bridge Design
- Bridge Section
- Bridge Modelling
- Looping statement: DO &End do
- Vehicle Load Creation

SESSION 8

- Geotechnical Module
- Terrain
- Retaining wall design
- Foundation design

SESSION 9

- Seismic Design

SESSION 10

- Steel Design

_____ End _____

PRINCIPAL
Jaipur Engineering College &
Research Centre
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