

**COLLEGE OF ENGINEERING ROORKEE**  
**SYLLABUS FOR**  
**VALUE ADDED PROGRAM (VAP)**



**DEPARTMENT OF INFORMATION**  
**TECHNOLOGY**

**Approved by:**

**HOD**

**Dean Academics**

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<b>ODD SEMESTER</b>	<b>1<sup>st</sup> SEM</b>
<b>Computer H/W, S/W &amp; Network Troubleshooting</b>	

<b>S No</b>	<b>Heading</b>	<b>Sub Heading</b>	<b>Hours</b>
1.	<b>Experimental and hands on training</b>	Identifying Computer Hardware Devices	<b>2 Hrs</b>
2.		Identifying Computer Assembly	<b>2 Hrs</b>
3.		Identifying external ports and interfacing	<b>2 Hrs</b>
4.		PC Identifying Problems & Troubleshooting	<b>2 Hrs</b>
5.		Operating System Installation	<b>2 Hrs</b>
6.		Printer - Installation / Troubleshooting	<b>2 Hrs</b>
7.		Introduction to LAN	<b>2 Hrs</b>
8.		Introduction to LAPTOPS	<b>2 Hrs</b>
9.		Hands on Training on PC Trainer KIT	<b>2 Hrs</b>
10.		Hands on Training on LAN Trainer KIT	<b>2 Hrs</b>
11.		Hands on Training on UPS Trainer KIT	<b>2 Hrs</b>
12.		Hands on Training on Monitor Trainer KIT	<b>2 Hrs</b>
13.		Preventive maintenance of a PC	<b>2 Hrs</b>
14.		Understanding CMOS	<b>2 Hrs</b>
15.		Working with Backups and Archival utilities	<b>2 Hrs</b>
16.			
<b>1.</b>	<b>Assembly of PC Hardware in Fiber Sheet Cabinet</b>		
<b>2.</b>	<b>Assembly of Single Board Computer (Raspberry PI)</b>		

3.	<b>Finding at least 20 types of PC Hardware Faults Using PC Trainer KIT</b>	
4.	<b>Setting up the working LAN topology using Network KIT</b>	
5.	<b>Finding faults in UPS using UPS Trainer KIT</b>	
	<b>Total Contact Hours</b>	<b>30 Hours</b>



<b>EVEN SEMESTER</b>	<b>2<sup>nd</sup> SEM</b>
<b>Web Designing with HTML</b>	

<b>S N</b>	<b>Heading</b>	<b>Subheading</b>	<b>Hours</b>
<b>1.</b>	<b>Hyper Text Markup Language (HTML)</b>	<p>Introduction To HTML, Structure of HTML, Attributes &amp; Values, Comments , Header Tags, Image Tag, Link Tags (Text &amp; Image),Marquee Tag, List Tag (Ordered &amp; Unordered),Table Tag, Form Tags, Audio ,Video Tags, About Iframe, Embedding of Google Maps ,You tube video, Block Level and Inline Elements, DIV Tag.</p> <p><b>HTML5 New Tags:</b> Header, Footer, Nav, Section, Article, Aside, New Form Elements.</p>	<b>4 Hr</b>
<b>2.</b>	<b>Style Sheet (CSS)</b>	Document Testing, About CSS Selectors, About CSS Properties, Background Properties, Box Properties, Border Properties, Positioning Properties, CSS Menu Design, CSS Animation.	<b>6 Hr</b>
<b>3.</b>	<b>Bootstrap (Responsive Design)</b>	Introduction to Responsive Design, Introduction to Bootstrap, Bootstrap Grid System, Grid Classes, Equal Columns, Unequal Columns, Layout Creation	<b>8 Hr</b>
<b>4.</b>	<b>Java Script</b>	Introduction to JavaScript , Variable , Operators , Conditions, Looping and Array, Introduction to functions, Popup Boxes (Alert ,Confirm ,Prompt), Introduction to functions, Form Handling, DOM Manipulation, Pre-defined functions, Introduction to Objects, What is property and methods, String , Math , Navigator , Date ,Array , Window Objects ,Introductions to object based technology, Class , object , property , inheritance, Client Side Validation (Regular Expression)	<b>6 Hr</b>
<b>5.</b>	<b>Web Hosting</b>	Manage Domain with name server,	<b>2 Hr</b>

		Manage Web Hosting from FTP and CPANEL, Managing Database, Email Accounts, Sub Domains etc., Live your project.	
<b>6.</b>	<b>Experiment/ Practical</b>	<p>Create a static website for college committees.</p> <p>Create any single page website.</p> <p>On the basis of their project presentation, grade and certificate will be distributed</p>	<b>4 Hr</b>
		<b>Total Contact Hours</b>	<b>30 Hours</b>

<b>ODD SEMESTER</b>	<b>3<sup>rd</sup> SEM</b>
<b>Node JS, Angular JS, Java Script with MySQL</b>	

<b>S N</b>	<b>Heading</b>	<b>Subheading</b>	<b>Hours</b>
<b>1</b>	<b>Introduction</b>	Big Words and AngularJS What is Angular?, Angular vs Angular 2 vs Angular 8, CLI Deep Dive & Troubleshooting, Project Setup and First App, Editing the First App	<b>8</b>
<b>2</b>	<b>Model, View, Controller</b>	Module Introduction, How an Angular App gets Loaded and Started, Components are Important! , Creating a New Component ,Understanding the Role of AppModule and Component Declaration ,Using Custom Components , Creating Components with the CLI & Nesting Components , Working with Component Templates ,Working with Component Styles, Fully Understanding the Component Selector ,Practicing Components ,What is Databinding? ,String Interpolation ,Property Binding ,Property Binding vs String Interpolation ,Event Binding ,Bindable Properties and Events ,Passing and Using Data with Event Binding ,Important: FormsModule is Required for Two-Way-Binding!, Two-Way-Databinding, Combining all Forms of Databinding , Practicing Databinding , 1 question, Understanding Directives , Using ngIf to Output Data Conditionally ,Enhancing ngIf with an Else Condition , Styling Elements Dynamically with ngStyle , Applying CSS Classes Dynamically with ngClass , Outputting Lists with ngFor , Practicing Directives , 1 question, Getting the Index when using ngFor	<b>8</b>
<b>3</b>	<b>Services and Dependency Injection, Data Binding and Directives</b>	Javascript Aside: Dependency Injection, The Scope Service, Javascript Aside: Functions and Strings, How Does Angular Do Dependency Injection?, Getting Other Services, Javascript Aside: Arrays and Functions, Dependency Injection and Minification Scope and Interpolation, Directives and Two Way Data Binding , Javascript Aside: The Event Loop ,Watchers and the Digest Loop , Common Directives , Common Directives (Part 2) , Javascript Aside: The XMLHttpRequest Object , External Data and \$http	<b>8</b>
<b>4</b>	<b>Single Page Applications, Custom Services &amp; Directives</b>	Angular Aside: Multiple Controllers, Multiple Views , HTML and Javascript Aside: Single Page Apps and the Hash , Routing, Templates, and Controllers , Routing Templates and Controller (Part 2) , Javascript Aside: Singletons , Creating a Service, HTML Aside: Reusable Components , Javascript and Angular Aside: Variable Names and Normalization , Angular and Normalized	<b>8</b>



		Attribute Names , 1 question Creating a Directive , Templates Scope (@, =, and other obtuse symbols) , Scope (@, =, and other obtuse symbols) (Part 2) , Scope (@, =, and other obtuse symbols) (Part 3) , Repeated Directives , Understanding 'Compile' , Understanding 'Link' , Understanding Transclusion	
<b>5</b>	<b>Let's Build an App: A Weather Forecast SPA</b>	A Weather Forecast SPA , A Custom Service , A Note Regarding API Usage , Binding Data (Part 1) , Binding Data (Part 2) , A Custom Directive , A Side Note , Improving our SPA's UX With ng-submit , Designing Services in Large AngularJS Applications , Nested Controllers, Clean Code, and 'Controller as' (an alternative to \$scope)	<b>8</b>
<b>6</b>	<b>Experiment/ Practical</b>	<b>Project: Blog website, Ecommerce website like flipkart/ amazon.</b> <b>After demonstration of project marks will be given by project committee</b>	
<b>Total Contact Hours</b>			<b>40</b>

<b>EVEN SEMESTER</b>	<b>4<sup>th</sup> SEM</b>
<b>Mobile App Development</b>	

S N	Heading	Subheading	Hours
1.	<b>Introduction</b>	<ul style="list-style-type: none"> <li>❖ What is Android?</li> <li>❖ Android versions and its feature set</li> <li>❖ The various Android devices on the market</li> <li>❖ The Android Market application store</li> <li>❖ Android Development Environment - System Requirements, Android SDK, Installing Java, and ADT bundle - Eclipse Integrated Development Environment (IDE), Creating Android Virtual Devices (AVDs)</li> </ul>	4
2.	<b>Android Architecture Overview</b>	<ul style="list-style-type: none"> <li>❖ Creating an Example Android Application: The Android Software Stack</li> <li>❖ The Linux Kernel, Android Runtime - Dalvik Virtual Machine, Android Runtime – Core Libraries, Dalvik VM Specific Libraries, Java Interoperability Libraries, Android Libraries</li> <li>❖ Application Framework, Creating a New Android Project ,Defining the Project Name and SDK Settings, Project Configuration Settings, Configuring the Launcher Icon, Creating an Activity, Running the Application in the AVD, Stopping a Running Application</li> <li>❖ Modifying the Example Application</li> <li>❖ Reviewing the Layout and Resource Files</li> </ul>	4
3.	<b>Android Software Development Platform</b>	<ul style="list-style-type: none"> <li>❖ Understanding Java SE and the Dalvik Virtual Machine</li> <li>❖ The Directory Structure of an Android Project</li> <li>❖ Common Default Resources</li> </ul>	4

		<p>Folders , The Values Folder , Leveraging Android XML, Screen Sizes</p> <ul style="list-style-type: none"> <li>❖ Launching Your Application: The AndroidManifest.xml File</li> <li>❖ Creating Your First Android Application</li> </ul>	
4.	<b>Android Framework Overview</b>	<ul style="list-style-type: none"> <li>❖ Android Application Components, Android Activities: Defining the UI</li> <li>❖ Android Services: Processing in the Background</li> <li>❖ Broadcast Receivers: Announcements and Notifications</li> <li>❖ Content Providers: Data Management</li> <li>❖ Android Intent Objects: Messaging for Components</li> <li>❖ Android Manifest XML: Declaring Your Components</li> </ul>	4
5.	<b>Graphical User Interface Screen with views</b>	<ul style="list-style-type: none"> <li>❖ Displaying Text with TextView, Retrieving Data from Users, Using Buttons, Check Boxes and Radio Groups, Getting Dates and Times from Users, Using Indicators to Display Data to Users, Adjusting Progress with Seek Bar</li> <li>❖ Working with Menus using views</li> </ul>	4
6.	<b>Displaying Pictures</b>	<ul style="list-style-type: none"> <li>❖ Gallery, Image Switcher, Grid View, and Image View views to display images</li> <li>❖ Creating Animation, Files, Content Providers, and Databases, Saving and Loading Files, SQLite Databases</li> <li>❖ Android Database Design, Exposing Access to a Data Source through a Content Provider, Content Provider Registration, Native Content Providers</li> </ul>	4
7.	<b>Windows Phone App Development Fundamentals</b>	<ul style="list-style-type: none"> <li>❖ Introduction to Windows Phone App Development, Installing the Windows Phone SDK, Creating Your First XAML for Windows Phone App</li> <li>❖ Fundamental Concepts in</li> </ul>	6

		Windows Phone Development, Understanding the Role of XAP Files, the Windows Phone Capabilities Model, the Threading Model for XAML-Based Graphics and Animation in Windows Phone, Understanding the Frame Rate Counter, The Windows Phone Application Analysis Tool, Applying the Model-View-ViewModel Pattern to a Windows Phone App.	
		<b>Total Contact Hours</b>	<b>30 Hours</b>

<b>ODD SEMESTER</b>	<b>5<sup>th</sup> SEM</b>
<b>Python with Machine Learning</b>	

<b>S N</b>	<b>Heading</b>	<b>Subheading</b>	<b>Hours</b>
7.	<b>Introduction to Machine Learning</b>	<ul style="list-style-type: none"> <li>❖ Application of Machine Learning</li> <li>❖ Supervised vs. Unsupervised Learning</li> <li>❖ Python Libraries suitable for Machine Learning</li> </ul>	7
8.	<b>Module 2 – Regression</b>	<ul style="list-style-type: none"> <li>❖ Linear Regression</li> <li>❖ Non – Linear Regression</li> <li>❖ Model evaluation methods</li> </ul>	7
9.	<b>Module 3 – Classification</b>	<ul style="list-style-type: none"> <li>❖ K-Nearest Neighbor</li> <li>❖ Decision Trees</li> <li>❖ Logistic Regression</li> <li>❖ Support Vector Machine (SVM)</li> <li>❖ Model Evaluation</li> </ul>	5
10.	<b>Module 4 – Unsupervised Learning</b>	<ul style="list-style-type: none"> <li>❖ K-Means Clustering</li> <li>❖ Hierarchical Clustering</li> <li>❖ Density-Based Clustering</li> </ul>	5

<b>11.</b>	<b>Module 5 - Final Project</b>	<ul style="list-style-type: none"> <li>❖ In this Module, you will do a project based on what you have learned so far, for example:-</li> <li>❖ <b>House Pricing Prediction</b></li> <li>❖ <b>Diabetes Prediction</b></li> <li>❖ <b>Salary Recommendation model</b></li> <li>❖ <b>Product Recommendation model</b></li> <li>❖ <b>Customer Segmentation model</b></li> <li>❖ <b>Delivery Segmentation model for courier services. ,etc</b></li> </ul>	<b>6</b>
		<b>Total Contact Hours</b>	<b>30 Hours</b>

<b>EVEN SEMESTER</b>	<b>6<sup>th</sup> SEM</b>
<b>Deep Learning</b>	

<b>S N</b>	<b>Heading</b>	<b>Subheading</b>	<b>Hours</b>
<b>1.</b>	<b>Introduction</b>	<ul style="list-style-type: none"> <li>❖ Various paradigms of learning problems</li> <li>❖ Perspectives and Issues in deep learning framework</li> <li>❖ review of fundamental learning techniques</li> </ul>	<b>2</b>
<b>2.</b>	<b>Feedforward neural network</b>	<ul style="list-style-type: none"> <li>❖ Artificial Neural Network</li> <li>❖ Activation function</li> <li>❖ Multi-layer neural network</li> </ul>	<b>4</b>
<b>3.</b>	<b>Training Neural Network</b>	<ul style="list-style-type: none"> <li>❖ Risk minimization</li> <li>❖ Loss function</li> <li>❖ Backpropagation</li> <li>❖ Regularization</li> <li>❖ Model selection and optimization.</li> </ul>	<b>4</b>
<b>4.</b>	<b>Conditional Random Fields</b>	<ul style="list-style-type: none"> <li>❖ Linear chain</li> <li>❖ Partition function</li> <li>❖ Markov network</li> <li>❖ Belief propagation</li> <li>❖ Training CRFs</li> <li>❖ Hidden Markov Model</li> <li>❖ Entropy</li> </ul>	<b>4</b>
<b>5.</b>	<b>Deep Learning</b>	<ul style="list-style-type: none"> <li>❖ Deep Feed Forward network</li> <li>❖ Regularizations</li> <li>❖ Training deep models</li> <li>❖ Dropouts</li> <li>❖ Convolutional Neural Network</li> <li>❖ Recurrent Neural Network</li> <li>❖ Deep Belief Network</li> </ul>	<b>6</b>
<b>6.</b>	<b>Probabilistic Neural Network</b>	<ul style="list-style-type: none"> <li>❖ Hopfield Net</li> <li>❖ Boltzman machine</li> <li>❖ RBMs, Sigmoid net</li> <li>❖ Autoencoders.</li> </ul>	<b>4</b>
<b>7.</b>	<b>Deep Learning research</b>	<ul style="list-style-type: none"> <li>❖ Object recognition</li> <li>❖ sparse coding, and computer vision</li> <li>❖ natural language processing</li> <li>❖ Deep Learning Tools: Caffe, Theano, Keras and PyTorch.</li> </ul>	<b>6</b>
		<b>Total Contact Hours</b>	<b>30 Hours</b>

<b>ODD SEMESTER</b>	<b>7<sup>th</sup> SEM</b>
<b>IOT and Data Science</b>	

S N	Heading	Subheading	Hours
12.	Introduction	What is Data Science?	3
		Big Data and Data Science hype and getting past the hype, why now?	
		Data fiction	
		Current landscape of perspectives skill sets needed	
13.	Statistical Inference	Populations and samples	3
		Statistical modeling, probability distributions	
		fitting a model - Intro to R	
14.	Exploratory Data Analysis and the Data Science	Process - Basic tools (plots, graphs and summary statistics) of ED	3
		Philosophy of EDA	
		The Data Science Process	
		Case Study: Real Direct (online real estate firm)	
15.	Three Basic Machine Learning Algorithms	Linear Regression - k-Nearest Neighbors (k-NN) - k-means	5
		One More Machine Learning Algorithm and Usage in Applications	
		Why Linear Regression and k-NN are poor choices for Filtering Spam	
		Naive Bayes and why it works for Filtering Spam	
		Data Wrangling: APIs and other tools for scrapping the Web	
16.	Feature Generation and Feature Selection	Feature Generation (brainstorming, role of domain expertise)	3
		Feature Selection algorithms	
		Filters; Wrappers	
		Decision Trees; Random Forests	
17.	Recommendation Systems	Building a User-Facing Data Product – Exercise	3
		Algorithmic ingredients of a Recommendation Engine	

		Dimensionality Reduction - Singular Value Decomposition	
		Principal Component Analysis	
18.	Mining Social-Network Graphs	Social networks as graphs -Direct discovery of communities in graphs	2
		Clustering of graphs	
		Partitioning of graphs - Neighborhood properties in graphs	
19.	Data Visualization	Basic principles, ideas and tools for data visualization	3
		Examples of inspiring (industry) projects -	
		Exercise: create your own visualization of a complex dataset	
20.	Data Science and Ethical Issues	Discussions on privacy, security, ethics	3
		- A look back at Data Science -	
		Next-generation data scientists	
21.	Projects for Evaluation	Loan Prediction Data	2
		Human Activity Recognition Data	
		Time Series Analysis Data	
		Wine Quality Data Analysis	
		Recommendation Engine Data	
		Urban Sound Classification	
		Total Contact Hours	30 Hours



<b>EVEN SEMESTER</b>	<b>8<sup>th</sup> SEM</b>
<b>Business Intelligence and Digital Marketing</b>	

<b>S N</b>	<b>Heading</b>	<b>Subheading</b>	<b>Hours</b>
22.	<b>Business, marketing &amp; e-marketing</b>	<ul style="list-style-type: none"> <li>❖ What is digital marketing?</li> <li>❖ Advantages of digital medium over other media</li> <li>❖ Digital medium in today's marketing plan</li> </ul>	4
23.	<b>Search marketing</b>	<ul style="list-style-type: none"> <li>❖ Basics of search marketing: organic &amp; paid search results</li> <li>❖ Overview of Google AdWords</li> <li>❖ Keyword research and analysis</li> <li>❖ Tracking the success of SEM</li> <li>❖ Search Engine Optimization techniques</li> <li>❖ On-page &amp; Off-page optimization</li> </ul>	4
24.	<b>Social media marketing</b>	<ul style="list-style-type: none"> <li>❖ Different social media channels</li> <li>❖ Social media for various businesses: B2C &amp; B2B</li> <li>❖ Measuring social media ROI</li> <li>❖ Content marketing: Storytelling in social media</li> </ul>	4
25.	<b>Email marketing</b>	<ul style="list-style-type: none"> <li>❖ The basics of email marketing</li> <li>❖ The concept of A/B testing &amp; its use in email marketing</li> </ul>	4
26.	<b>Display marketing &amp; Mobile Marketing</b>	<ul style="list-style-type: none"> <li>❖ Different kinds of display marketing</li> <li>❖ The display marketing ecosystem</li> <li>❖ Retargeting &amp; dynamic retargeting</li> <li>❖ Different kinds of mobile marketing</li> <li>❖ The mobile marketing ecosystem</li> </ul>	4

27.	<b>Web analytics</b>	<ul style="list-style-type: none"> <li>❖ Digital measurement landscape</li> <li>❖ Introduction to Google Analytics</li> <li>❖ Interpreting the data in Google Analytics.</li> </ul>	<b>4</b>
28.	<b>Team Project</b>	<ul style="list-style-type: none"> <li>❖ Project based on industry case study.</li> </ul>	<b>6</b>
		<b>Total Contact Hours</b>	<b>30 Hours</b>