TEERTHANKER MAHAVEER UNIVERSITY
COLLEGE OF COMPUTING SCIENCES & IT

OPEN ELECTIVE COURSES

Under

Choice Based Credit System

[w.e.f. 2020-21]

Teerthanker Mahaveer University, Moradabad

College of Computing Sciences & IT

S. No.	Course Code	Open Elective Course Name	Periods			Credit
			L	T	P	
1	OECOP101	Data Science	3	1	0	4
2	OECOP102	Big Data Analytics	3	1	0	4
3	OECOP103	Human Values & Professional Ethics	3	1	0	4
4	OECOP104	Introduction to Web Design	3	1	0	4
5	OECOP105	Data Base Management System	3	1	0	4
6	OECOP106	Introduction to R Programming	3	0	0	3
7	OECOP107	Python Programming & Introduction to Data Science	3	1	0	4
8.	OECOP108	Java Programming	3	0	0	3
9.	OECOP109	Cloud Computing	3	0	0	3
10	OECOP110	Project Management for Engineers	3	0	0	3
11	OECOP111	Cyber Law & Information Security	3	0	0	3
12	OECOP112	Concept of IoT(Internet of Things)	3	0	0	3

Course Code:OECOP101	**Data Science**	**L-3 T-1 P-0 C-4**
Course Outcomes:	**On completion of the course, the students will be :**	
CO1.	Understanding the basic concept Data Science and the skill sets needed to be a data scientist.	
CO2.	Understanding basic statistical modeling and analysis techniques.	
CO3.	Understanding the Data Science Process and its components.	
CO4.	Applying EDA and the Data Science process in a case study.	
CO5.	Applying basic machine learning algorithms like Linear Regression, k-Nearest Neighbors (k-NN), k-means, etc for predictive modeling.	
Course Content:		
Unit-1:	**Introduction to Statistics:** Basic Terms, Variable and Types, Measures of Central Tendency, Measures of Dispersion, Population Vs Sample, Chebysheff's Theorem, PDF, Distributions- Binomial, Poisson, Normal, Standard Normal, Calculating Normal Probabilities –using z-table, normal table, Central Limit Theorem	**8 Hours**
Unit-2:	**Sampling Distribution and Hypothesis Testing-** Sampling Distribution of the mean, Sampling Distribution of two Dice, Difference between two means, estimation- point and interval estimation, confidence levels, interval width, selecting sample size, sample size to estimate mean size, Hypothesis testing and errors, Sampling distributions (Chi-Square, t, F, z), fitting a model	**8 Hours**
Unit-3:	**Data Science, Role and Process:** Data Science Role, Drivers and Application era of Data Science, Life cycle of Data Science(ETL Preprocessing)- EDA process, Data Extraction, Load, Imputation, Cleaning, Transformation, Visualization(lines, curves and 3D spaces), Analysis, Model selection and evaluation- Selecting a model, building model and optimization, Role of Data Scientist, Data Science and Ethical Issues	**8 Hours**
Unit-4:	**Machine Learning Algorithms-I:** Linear Regression- Regression Analysis, simple one variable regression line, Estimating ("Learning") Model Coefficients, Gradient descent algorithm- cost function to find 'beta' values and concept, local and global minima, concept of learning rate, Logistic Regression- Logistic regression model, Sigmoid function and visualization, decision boundary (linear and non-linear), metrics for logistic regression (accuracy, sensitivity, specificity etcetera concepts), RoC curve- use of RoC curve to find out optimum decision boundary	**8 Hours**
Unit-5:	**Machine Learning Algorithms-II:** Decision trees and random forests- model, parameter meaning and explanation, Naive Bayes-	**8 Hours**

	Retail basket analysis, Concept of boosting and bagging, Unsupervised learning methods/Clustering- K-means algorithm, optimization objective. Association Rules- Association rule mining, K-nearest neighbors algorithm.	
Text Books:	1. Joel Grus, "Data Science from Scratch", O'Reilly. 2015.	
Reference Books:	1. Kevin P. Murphy. Machine Learning: A Probabilistic Perspective. 2013. 2. Foster Provost and Tom Fawcett. Data Science for Business: What You Need to Know about Data Mining and Data-analytic Thinking. 2013. 3. Trevor Hastie, Robert Tibshirani and Jerome Friedman. Elements of Statistical Learning, Second Edition. 2009. *** Latest editions of all the suggested books are recommended.**	
Additional Electronic Reference:	1.https://intellipaat.com/blog/tutorial/data-science-tutorial/ 2.https://elitedatascience.com/data-science-resources	

Course Code:OECOP102	**Big Data Analytics**	**L-3 T-1 P-0 C-4**
Course Outcomes:	**On completion of the course, the students will be :**	
CO1.	Understanding the requirement of Big data with respect to 5 V's.	
CO2.	Understanding the basic storage structure used in Big data with respect to clusters.	
CO3.	Understanding the Hadoop Ecosystem and its components.	
CO4.	Analyzing the data processing in Big data with HIVE , PIG and HBASE.	
CO5.	Analyzing the functionality and working of Zookeeper for monitoring Servers in Cluster.	
Course Content:		
Unit-1:	**INTRODUCTION TO BIG DATA:** Introduction – distributed file system – Big Data and its importance, Four Vs, Drivers for Big data, Big data analytics, Big data applications. Algorithms using map reduce, Matrix-Vector Multiplication by Map Reduce.	**8 Hours**
Unit-2:	**INTRODUCTION HADOOP:** Big Data – Apache Hadoop & Hadoop EcoSystem – Moving Data in and out of Hadoop – Understanding inputs and outputs of MapReduce - Data Serialization.	**8 Hours**
Unit-3:	**HADOOP ARCHITECTURE:** Hadoop Architecture, Hadoop Storage: HDFS, Common Hadoop Shell commands , Anatomy of File Write and Read., NameNode, Secondary NameNode, and DataNode, Hadoop MapReduce paradigm, Map and Reduce tasks, Job, Task trackers - Cluster Setup – SSH & Hadoop Configuration – HDFS Administering –Monitoring & Maintenance.	**8 Hours**
Unit-4:	**HIVE AND HIVEQL, HBASE:**Hive Architecture and Installation, Comparison with Traditional Database, HiveQL – Querying Data - Sorting And Aggregating, Map Reduce Scripts, Joins & Subqueries, HBase conceptsAdvanced Usage, Schema Design, Advance Indexing - PIG, Zookeeper - how it helps in monitoring a cluster, HBase uses Zookeeper and how to Build Applications with Zookeeper.	**8 Hours**
Unit-5:	**Big Data Analytics:** Introduction to Big data Business Analytics - State of the practice in analytics role of data scientists - Key roles for successful analytic project - Main phases of life cycle - Developing core deliverables for stakeholders.	**8 Hours**
Text Books:	1. Boris lublinsky, Kevin t. Smith, Alexey Yakubovich, "Professional Hadoop Solutions",Wiley, ISBN: 9788126551071, 2015.	
Reference Books:	1. Tom White, "HADOOP: The definitive Guide" , O Reilly 2012.	

	2. Vignesh Prajapati, “Big Data Analytics with R and Haoop”, Packet Publishing 2013. 3.Tom Plunkett, Brian Macdonald et al, “Oracle Big Data Handbook”, Oracle Press, 2014 *** Latest editions of all the suggested books are recommended.**	
Additional Electronic Reference:	1.https://www.tutorialspoint.com/big_data_analytics/index.htm 2.https://www.businessprocessincubator.com/content/big-data-analytics-tutorial-materials-syllabus/	

Course Code:OECOP103	**Human Values & Professional Ethics**	**L-3 T-1 P-0 C-4**
Course Outcomes:	**On completion of the course, the students will be :**	
CO1.	Understanding the concepts of Morals, Values, Ethics and Value education.	
CO2.	Understanding the concept of work ethics and find out the difference between profession, ethics and happiness.	
CO3.	Analyzing the concept of trust, spiritualism, and focus on problems related to stress.	
CO4.	Understanding the concept and meaning of Intellectual Property Rights, Cybercrime, Plagiarism and misconduct	
CO5.	Understanding about e-waste and creating a balance between computer ethics and corporate social responsibility.	
Course Content:		
Unit-1:	**Introduction to Value Education:** Understanding of Morals, Values and Ethics; Need, Content and Process for Value Education. Attributes of A Good Character- Integrity, Work Ethic, Respect For Others, Living Peacefully, Cooperation, Commitment, Empathy etc. Spirituality: Introduction to Yoga and Meditation for Professional Excellence and Stress Management. Understanding Harmony in the Family and Society.	**8 Hours**
Unit-2:	**Ethics & Technology:** Impact of Technological Growth on Society and Value System; Reports of Club of Rome, Appropriate Technology Movement of Schumacher, Problems of Technology Transfer, Technology Assessment Impact Analysis, Human Operator in Engineering Projects & Industries, Problems of Man-Machine Interaction, Human Centered Technology, Safety and Risk Analysis.	**8 Hours**
Unit-3:	**Ethics of Profession:** Ethical Issues in Engineering Practice, Conflicts of Interest: Conflicts between Business Demands and Professional Ethics. Social and Ethical Responsibilities of Technologists. Ethical Issues at Workplace: Discrimination, Cybercrime, Plagiarism, Sexual Misconduct, Fraudulent Use of Institutional Resources. Intellectual Property Rights and its uses.Whistle blowing and beyond, Case studies**.**	**8 Hours**

Unit-4:	**Profession and Human Values:** Values Crisis in Contemporary Society; Value Spectrum of Good Life; Integrated Personality. Modern Search for a Good Society: Justice, Democracy, Secularism, Rule of Law. Values in Indian Constitution. Canons of ethics: Ethics of Virtue; Ethics of Duty; Ethics of Responsibility.	**8 Hours**
Unit-5:	**Global Issues & Professional Ethics:** MNCs & Morality; Case Study: Bhopal Gas Tragedy. Environmental Ethics: Disposal of Plastic Waste, e-Waste, Industrial. Computer Ethics: Problems in Computer Ethics. Weapons Development: Impact on Society & Humanity. Moral Leadership; Corporate Social Responsibility. Engineering Council of India.	**8 Hours**
Text Books:	1. RS Naagarazan, A Text Book on Professional Ethics & Human Values, New Age International Publishers	
Reference Books:	1. Deborah Johnson, Ethical Issues in Engineering, Prentice Hall, Englewood Cliffs, New Jersey 2. Stephen H Unger, Controlling Technology: Ethics and the Responsible Engineers, John Wiley & Sons, New Yor 3. A N Tripathi, Human values in the Engineering Profession, Monograph published by IIM, Calcutta 4. Sathya Sai Education in Human Values, UK Newsletter, 2/2003 www.sathyasaiehv.org.uk	

Course Code:OECOP104	Introduction to Web Design	L-3 T-1 P-0 C-4
Course Outcomes:	**On completion of the course, the students will be :**	
CO1.	Understanding the basics of web technologies, HTML, Linking of HTML files.	
CO2.	Understanding the concept of Image alignment text alignment in HTML.	
CO3.	Understanding the concept of web page working, creating forms using of buttons.	
CO4.	Understanding various operations on cascading style sheet (CSS).	
CO5.	Understanding the bootstrap framework with its features and layout.	
Course Content:		
Unit-1:	HTML – URI, LIST, Hyperlinks: History of HTML, Introduction to URI: Fragment Identifier & Relative Uniform Resource indicator, Standard Generalized Markup Language, Structure of HTML document, Switching between your Editor and Browser, Structuring Web Page, Paragraph and Line Break Tags, Adding Comments, Formatting your Text; Creating Lists: Ordered List Tags, Unordered List Tag & Nesting Lists: Controlling How Ordered Lists are displayed, Creating a Multilevel Outline, Using Start and Value Attributes in an Ordered List, Controlling the Display of Unordered List, Creating Definition List; Creating Hyper Text Links, Linking to a File or Data Object, Linking to NON-WWW Files, Linking to a Place in the Same HTML File, Linking to a Place in Another HTML File, Creating Link Lists, Creating a Simple Link List	**8 Hours**
Unit-2:	HTML – Images, Links, Rules, Address Tag and Text: Inserting Images: Using the Align Attribute in Inline Graphics, Setting the Height and Width of an Inline Image; Creating Image Links; Horizontal Rules: Changing the Height of a Horizontal Rule, Changing between Shaded and Un-shaded Horizontal Rule, Changing the Width of a Horizontal Rule, Setting the Alignment of a Horizontal Rule; Address Tag; Working with Text: Text Alignment, Changing Font Sizes and Colors: Setting Font Sizes, Setting the Base Font, Using the Small and Big tags, Changing the Font Color; Using a Background Image; Marquee Tag	**8 Hours**
Unit-3:	Web Page Authoring using HTML: Tables: Creating Columns and Rows, Adding a Border, Adding Column Headings, Adding Spacing and Padding, Adding a Caption, Setting the Table Width and Height, Aligning Cell	**8 Hours**

	Contents, Setting Column Width, Centering a Table, Inserting an Image, Spanning Columns & Spanning Rows, Setting Font Size and Colors, Assigning Background Colors; Frames: Percentage dimensions, Relative dimensions, Creating two rows Frames, Creating two columns frames, Creating two rows and the second row containing two columns; Forms: What is Form?, Form Tag, Method, Action, Input Tag, Type Attribute: Check box, Hidden, Image, Radio, Reset, Submit, Text Cascading Style Sheets (CSS): Properties Table: Using the style Attribute, Creating Classes and IDs, Generating External Style Sheets, Typography, Consistency, Types of styles, Specifying class within HTML document, Style placement: Inline style, Span & div tags, header styles, Text and font attributes: Font Vs CSS, changing fonts, text attributes, Advance CSS properties: Backgrounds, Box properties and Positioning	
Unit-4:	Bootstrap Framework , History of Bootstrap , Advantages of Bootstrap Framework, What is Responsive web page, Major Features of Bootstrap, What is Mobile-First Strategy, How to apply Bootstrap to Applications, Bootstrap Grid , Advantages of Bootstrap Grid, Display responsive Images, use readymade themes. Bootstrap Tables, Bootstrap Form Layout.	**8 Hours**
Text Books:	1. Burdman, Collaborative Web Development , Addison Wesley.	**8 Hours**
Reference Books:	1. Bayross Ivan, Web Technologies Part II , BPB Publications. 2. HTML and CSS: Design and Build Websites By Jon Duckett 3. Bootstrap Quick Start by Jake Spurlock. Publisher: O'Reilly Media, Inc 4. Robert. W. Sebesta, "Programming the World Wide Web", Fourth Edition, Pearson Education. 5. Deitel, Deitel, Goldberg, "Internet & World Wide Web How To Program", Third Edition, Pearson Education. 6. Marty Hall and Larry Brown,"Core Web Programming" Second Edition, Volume I and II, Pearson Education. 7. Bates, "Developing Web Applications", Wiley.	
Additional Electronic Reference Material:	1. https://www.creativebloq.com/web-design/10-design-concepts-web-developers-need-know-11135255	

Course Code:OECOP105	Data Base Management System	L-3 T-1 P-0 C-4
Course Outcomes:	**On completion of the course, the students will be :**	
CO1.	Understanding the basics of database concepts including Characteristics, design of data models, database architecture and database languages.	
CO2.	Understanding the performance of data models using entity relationship model and relational model with the help of E-R diagram, extended E-R diagram, key concepts and integrity constraints.	
CO3.	Understanding and analyzing the relational tables and evaluate the results with DDL, DML and DCL queries and operations like sub queries, join, union and intersection using SQL.	
CO4.	Understanding and remembering the concept of functional dependency and normalization upto 3NF and BCNF on relational tables with transaction processing, serializability and recovery.	
CO5.	Applying the concept of concurrency control protocols and locking on database transactions with recovery techniques and database security	
Course Content:		
Unit-1:	**Introduction:** An overview of database management system, Database System Vs File System, Database system concepts and architecture, data models schema and instances, data independence and data base language and interfaces, Data definitions language, DML, Overall Database Structure.	**8 Hours**
Unit-2:	**Data modeling using the Entity Relationship Model:** ER model concepts, notation for ER diagram, mapping constraints, keys, Concepts of Super Key, candidate key, primary key, Generalization, aggregation, reduction of an ER diagrams to tables, extended ER model. **Relational data Model and Language:** Relational data model concepts, integrity constraints: entity integrity, referential integrity, Keys constraints, Domain constraints, relational algebra.	**8 Hours**
Unit-3:	**SQL:** Characteristics of SQL, Advantages of SQL, SQL data types and literals, Insert, update and delete operations ,sub queries, Aggregate functions, Joins, Unions, Intersection, Minus operations. Roles and	**8 Hours**

	Privileges.	
Unit-4:	**Data Normalization:** Functional dependencies, Normal form up to 3rd normal form & BCNF **Transaction Processing Concepts:** Transaction system, testing of serializability, Serializability of schedules, conflict & view serializable schedule, recoverability, Recovery from transaction failures.	**8 Hours**
Unit-5:	**Concurrency Control Techniques:** Concurrency control, locking Techniques for concurrency control, Time stamping protocols for concurrency control, validation based protocol, multiple granularity. Overview of recovery techniques and Database Security.	**8 Hours**
Text Books:	1. Silberschatz Abraham, Korth Henry &Sudarshan S., Database Systems Concepts, McGraw Hill, 1997.	
Reference Books:	1. Elmarsi R. &Navathe S.B., Fundamentals of Database Systems, Addison Wesley, 2004 2. Date C.J., An Introduction to Database Systems, Addition Wiley. 3. Melton Jim& Simon Alan, Understanding the New SQL: A Complete Guide, Morgan Kaufmann Publishers, 1993. 4. Majumdar A. K. &Battacharya P., Data Base Management Systems, Tata McGraw Hill, 1996. 5. Bipin Desai, An Introduction to Database Systems, Galgotia Publications, 1991	
Additional Electronic Reference Material:	1. https://www.guru99.com/what-is-dbms.html	

Course Code:OECOP106	Introduction to R Programming	L-3 T-0 P-0 C-3
Course Outcomes:	**On completion of the course, the students will be :**	
CO1.	Understanding the basic of R programming, data types, operators, R vectors, R matrix, Categorical and continuous variables, understanding about Data frames, lists, sorting and merger of data frames.	
CO2.	Understanding basic programming structure in R, conditions, loops, understanding import data from CSV, Excel, SPSS, STATA, SAS files, export data to various file format. Understanding aggregate function.	
CO3.	Understanding data visualization, elementary statistics, Sampling distributions, Hypothesis testing, Linear Regression, Multiple Linear Regression, Linear Model selection.	
CO4.	Understanding grammar of graphics, graph plotting, understanding debugging tools traceback(), debug().	
CO5.	Understanding Clustering in R, K-Means and k-medoids clustering, Analyzing Time Series, understanding reading, plotting and decomposing time series data, understanding ARIMA models, Text mining using R.	
Course Content:		
Unit-1:	Introduction: R programming language, R data types, Arithmetic and logical operators. R Vectors, R Matrix: Create, print, add column, slice. Factor in R: Categorical and continuous variables. Data Preparation: R data frames: create, append, select, subset. List in R, R sort a data frame, merge data frames in R.	**8 Hours**
Unit-2:	Programming: Control structure: if, else, else if, for loop, nested for loop, repeat loop, while loop,next, break. Functions, Loop Functions: apply(), lapply(), sapply(), tapply(),split(),mapply(),vectorizing a functions. Import data in R: read CSV, Excel, SPSS, STATA, SAS file. Replacing missing value in R. R exporting data to excel : CSV, SAS, STATA, Text File . R aggregate function.	**8 Hours**
Unit-3:	Statistics and Probability: Elementary statistics; Basic Data Visualization; Probability; Common Probability distribution.	**8 Hours**

	Statistical Testing and Modeling: Sampling distributions; Hypothesis testing; Analysis of Variance; Simple Linear Regression; Multiple Linear Regression; Linear Model selection**.**	
Unit-4:	Advanced Graphs: Advanced Plot Customization; Grammar of Graphics; Defining color and Plotting in Higher dimension; Interactive 3D plots. Debugging: Tools in R, using traceback(), using debug(), using recover()	**8 Hours**
Unit-5:	Clustering using R: K-Means and k-medoids clustering; Case study; Hierarchical clustering procedures. Time Series Analysis: Reading, plotting and decomposing time series data; Forcasting using exponential smoothing; ARIMA models; Text mining using R.	**8 Hours**
Text Books:	1. Sandeep Rakshit,R Programming for Beginners.	
Reference Books:	1. Norman Matloff, The Art of R Programming". 2. R Programming for Data Science, 3. Hadley Wickham, R for Data Science.	
Additional Electronic Reference Material:	1. https://www.r-project.org/about.html	

Course Code:OECOP107	**Python Programming & Introduction to Data Science**	**L-3 T-1 P-0 C-4**
Course Outcomes:	**On completion of the course, the students will be :**	
CO1.	Understand programming skills in core Python.	
CO2.	Understand Object Oriented Skills in Python	
CO3.	Understand important aspects related with string, lists and dictionary in python.	
CO4.	Apply the skill of designing user defined functions in python.	
CO5.	Develop the ability to work on database applications.	
Course Content:		
Unit-1:	Introduction History, Features, Setting up path, Working with Python, Basic Syntax ,Variable and Data Types , Operator Conditional Statements If ,If- else ,Nested if-else Looping For, While ,Nested loops Control Statements Break, Continue ,Pass	**8 Hours**
Unit-2:	String Manipulation Accessing Strings ,Basic Operations ,String slices ,Function and Methods Lists Introduction ,Accessing list ,Operations ,Working with lists ,Function and Methods Tuple Introduction ,Accessing tuples ,Operations ,Working ,Functions and Methods	**8 Hours**
Unit-3:	Dictionaries Introduction, Accessing values in dictionaries ,Working with dictionaries ,Properties ,Functions Functions Defining a function , Calling a function, Types of functions ,Function Arguments ,Anonymous functions ,Global and local variables	**8 Hours**
Unit-4:	Modules Importing module ,Math module ,Random module ,Packages ,Composition Input-Output Printing on screen ,Reading data from keyboard ,Opening and closing file ,Reading and writing files ,Functions. **Database**- connectivity, Transactions using MYSQL.	**8 Hours**
Unit-5:	Exception Handling Exception ,Exception Handling ,Except clause ,Try ? finally clause ,User Defined Exceptions, OOPs concept Class and object, Attributes ,Inheritance ,Overloading fuction and operator ,Overriding ,Data hiding , Scientific libraries in Python – NumPy, SciPy,	**8 Hours**

	Matplotlib and Pandas	
Text Book:	1. Learning Python by Mark Lutz, David Ascher Shop O'Reilly - O'Reilly Media	
Reference Books:	1. "Learn Python the Hard Way" by Zed A. Shaw 2. "Python Essential Reference" by David M. Beazley, Addison Wesley 3. "Python in a Nutshell" by Alex Martelli, Oreilly Publication. 4. "Think Python" by Allen Downey, Green Tea Press 5. "Core Python Programming" by Wesley J. Chun, Pearson Education 6. "An Introduction to Python by Guido Van Russom, Fred L.Drake, Network Theory Limited. 7. "Beginning Python: From Novice To Professional By Magnus Lie Hetland, Second Edition Apress 8. "Programming in Python" by Mark Summerfield, Pearson Education	
Additional Electronic Reference Material:	1. https://www.python.org/about/gettingstarted/ 2. https://www.programiz.com/python-programming	

Course Code:OECOP108	JAVA PROGRAMMING	L-3 T-0 P-0 C-3
Course Outcomes:	**On completion of the course, the students will be :**	
CO1.	Understanding the object oriented approach of programming, basic building blocks of java programming, java development environment, datatypes, class, methods, and various predefine packages.	
CO2.	Understanding the various predefine classes, interfaces, which deals with networking, understanding the basic approach of graphical user interface design using Abstract window toolkit and Applet.	
CO3.	Understanding the basic concept of Event handling, Applying the concept of thread and multithreading.	
CO4.	Understanding the Database connectivity using java, along with the classes and methods of java.sql package and creating basic programs using this package.	
CO5.	Understanding the concept of java Bean, session bean, Enterprise Java Bean, client server concept using Remote Method Invocation. Creating basic application using RMI architecture.	
CO6.	Understanding the web architecture of java programming, understanding the various servers and deployment of application on servers, Understanding Servlets and java server pages,	
CO7.	Applying the graphical user interface design concept using Swing, Analyzing the predefine methods and interfaces of Swing package and creating basic user interface using swing.	
CO8.	Analyzing the various methods of java.servlet package and creating basic web application using this package.	
Course Content:		
Unit-1:	**Core Java:** Operators, Data types, Variables, Arrays, Control Statements, Methods &Classes, Inheritance, Package and Interface, Exception Handling, Multithread programming, I/O, Java Applet, String handling, Networking, Event handling. **Abstract Window Toolkit (AWT):** Controls, Layout managers, Menus, Images, Graphics	**8 Hours**
Unit-2:	**Java Swing:** Creating a Swing Applet and Application, Programming using Panes, Pluggable Look and feel, Labels, Text fields, Buttons, Toggle buttons, Checkboxes, Radio Buttons, View ports, Scroll Panes, Scroll Bars, Lists, Combo box, Progress Bar, Menus and Toolbars, Layered Panes, Tabbed Panes, Split Panes, Layouts, Windows, Dialog Boxes, Inner frame.	**8 Hours**
Unit-3:	**JDBC:** Connectivity Model, JDBC/ODBC Bridge, java.sql package, Connectivity to remote database,navigating through multiple rows retrieved from a database.	**8 Hours**
Unit-4:	**Java Beans:** Application Builder tools, Bean developer kit (BDK), JAR files, Introspection, Developing a simple bean, Using Bound properties, Java Beans API, Session Beans, Entity Beans, Enterprise Java beans (EJB), RMI (Remote Method Invocation), A simple client-server application using RMI.	**8 Hours**
Unit-5:	**Java Servlets:** Basics, API basic, Life cycle, Running, Debugging, Thread-safe, HTTP Redirects, Cookies, Java Server pages (JSP).	**8 Hours**

Text Books:	**1.** Margaret, L. Y.*, The Complete Reference- Internet*, Tata McGraw Hill.	
Reference Books:	**1.** Balagurusamy, E., *Programming in JAVA*, Tata McGraw Hill. **2.** Dustin, R. Callway*Inside Servlets*, Addison-Wesley. **3.** Steven, H., *Java2 Black Book*, Dreamtech. *** Latest editions of all the suggested books are recommended.**	
Additional Electronic Reference Material:	1. https://www.youtube.com/watch?v=J_d1fJy90GY&list=PLbRMhDVUMngcx5xHChJ-f7ofxZI4JzuQR 2. https://www.youtube.com/watch?v=0GkqhLcym48&list=PL3618681FEEDA821F 3. https://www.youtube.com/watch?v=DeL-OoWyNrE	

Course Code:OECOP109	CLOUD COMPUTING	L-3 T-0 P-0 C-3
Course Outcomes:	**On completion of the course, the students will be :**	
CO1.	Understanding the Cloud Computing and its role in current scenario.	
CO2.	Understanding the different models of Cloud Computing and their limitations	
CO3.	Understanding the virtual data centre architecture, governance strategy, security mechanism and contingency plans.	
CO4.	Identifying various risk factors involved in Cloud Computing and to tackle them using risk management techniques	
CO5.	Understanding the importance of Cloud services and economic factors related to them	
CO6.	Understanding the billing process for usage of Cloud Computing and factors that controls the bill amount	
CO7.	Understanding the architecture and considerations for storage network design using technologies like iSCSI, FCIP, FCoE etc.	
Course Content:		
Unit-1:	**Cloud Computing:** Existing usage of cloud computing; New paradigm in the cloud; Applications. **Cloud Computing Architectural Framework:** Cloud: Benefits, Vocabulary, Business scenarios, Essential characteristics, Deployment models, Service models, Multi-tenancy, Approaches to create a barrier between the tenants.	**8 Hours**
Unit-2:	**Vendor Lock-in and Efforts at Standardization:** Need of migration; Preventing vendor lock-in; Comparison chart. **Cloud Software:** Scripting languages; Eucalyptus; Cloud-optimized Linux; ABIQUO; Problem of metering Cloud broker.	**8 Hours**
Unit-3:	**Cloud Economics and Capacity Management:** Restricted choices; Capacity planning; Queuing and response time; Evidence based decision making; Instrumentation (measuring resource consumption); Bottlenecks; Key volume indicators.	**8 Hours**
Unit-4:	**Cloud Reliability, Fault Tolerance and Response Time:** Business continuity management: System reliability, Human factors; Case studies on designing for reliability; Concept of fault tolerance; Response time. **Internet Cloud Security:** Introduction; Potential threats; Security as a service by cloud providers; Fraud theory and Intellectual property; Security engineering.	**8 Hours**
Unit-5:	**Case Studies on Cloud Computing Applications:** Amazon's cloud services (AWS); Windows Azure; Cloud software for private banking.	**8 Hours**
Text Books:	1. David, E.Y. Sarna, *Implementing and Developing Cloud Computing Applications*, CRC Press.	
Reference Books:	1. Mather, T., *Cloud Security and Privacy: An Enterprise Perspective On Risks And Compliance,* O'Relly. *** Latest editions of all the suggested books are recommended.**	
Additional Electronic	https://nptel.ac.in/courses/106/105/106105167/	

Reference Material:	https://www.youtube.com/watch?v=EN4fEbcFZ_E	
Course Code:OECOP110	**Project Management for Engineers**	L-3 T-0 P-0 C-3
Course Outcomes:	On completion of the course, the students will be :	
CO1.	Understanding Project Management & its evaluation	
CO2.	Understanding and analysis the technical feasibility of a project	
CO3.	Understanding financial system and analyze the use of funding mechanism	
CO4.	Understanding the application of laws related to business and project execution	
CO5.	Understanding Financial Accounting and Financial Statements for business	
Course Content:		
Unit-1:	Project Management & Sources of Funds: Project Management- Introduction, Need, Phases and Processes of Project Management. Financial Markets as Sources of Funds: Money Market & Capital Market. Overview of Regulatory Framework of Financial System in India- SEBI, RBI, and NABARD.	8 Hours
Unit-2:	Project Feasibility & Analysis: Project Identification, Generation Of Ideas, SWOT Analysis, Screening and Project Rating Index. Market & Demand Analysis: Collection of Data, Market Survey, Project Risk Analysis.	8 Hours
Unit-3:	Project Technical Analysis: Selection of Technology, Plant Capacity, Structures and Civil Work. Location- Factors, Costs, Availability of Resources. Environmental Aspects, Project Implementations. Financial Analysis: Project Cost, Cost of Production, Cost of Capital, Time Value of Money.	8 Hours
Unit-4:	Regulatory Framework for Project: Legal Environment of Business, Law of Contract- Meaning and Concepts, Contract of Agent and Agency, Power of Attorney, Consumer Protection Law-Introduction, Rights of Consumers, Complaints & its Remedies, Intellectual Property Law-Introduction, Rights from Patents & Copyright, Infringement its Remedies, Overview of Companies Act, Foreign Exchange Management Law, Labour Laws in India, Various Project Approvals from Local, State & Central Government.	8 Hours
Unit-5:	Basics of Accounting for Project: Introduction, Meaning of Account & Accountancy, Book-keeping, Accounting Process, Users of accounting	8 Hours

	information, Double Entry Accounting, Accounting Equation. Introduction to Trial Balance, Trading Account, Profit and Loss Account, Balance Sheet, Cash Flow and Fund Flow. Budget- Meaning of a Budget & Budgeting, Budgetary Control, Types of Budgets.	
Text Books:	1. Chaudhary, S., Project Management, Tata Mc Graw Hill Publications	
Reference Books:	1. Bhole L.M., Financial Institutions and Markets, Tata McGraw-Hill 2. Srivastava, R.M & Nigam Divya, Management of Financial Institutions, Himalaya 3. Goyal B.B., Project Management: A Development Perspective, Deep & Deep Publications. * Latest editions of all the suggested books are recommended.	
Additional Electronic Reference Material:	https://nptel.ac.in/courses/110/104/110104073/ https://www.youtube.com/watch?v=gEhr0ZAL2zE	

Course Code:OECOP111	CYBER LAW & INFORMATION SECURITY	L-3 T-0 P-0 C-3
Course Outcomes:	**On completion of the course, the students will be :**	
CO1.	Understanding of the information system architecture and the involved components.	
CO2.	Understanding of the basic principles of Information Security, Online payment systems and related security issues along with the rules of E Governance.	
CO3.	Applying and regulating Cyber Laws dealing with Cyber Ethics by implementation of Intellectual Property Right in the areas of Copyright, Patent, Piracy and Plagiarism.	
CO4.	Analyzing the security of Cryptographic System and design and implementation issues related with Firewalls, Virtual Private Networks and Intrusion Detection Systems.	
CO5.	Analyzing the need of physical security in Information System, need of Biometric Security System and related challenges.	
Course Content:		
Unit-1:	History of Information Systems and its Importance, basics, Changing Nature of InformationSystems, Need of Distributed Information Systems, Role of Internet and Web Services,Information System Threats and attacks, Classification of Threats and Assessing DamagesSecurity in Mobile and Wireless Computing: Security Challenges in Mobile Devices, Authentication Service Security, Security Implication for organizations, Laptops Security Functions of various networking components- routers, bridges, switches, hub, gateway.	**8 Hours**
Unit-2:	Basic Principles of Information Security, Confidentiality, Integrity Availability and other terms in Information Security, Information Classification and their Roles. Security Threats toEcommerce, Virtual Organization, and Business Transactions on Web, E Governance and EDI, Concepts in Electronics payment systems, E Cash, Credit/Debit Cards.	**8 Hours**
Unit-3:	Physical Security: Needs, Disaster and Controls, Basic Tenets of Physical Security and physical Entry Controls. Access Control-Biometrics, Factors in Biometrics Systems, Benefits, and Criteria for selection of Biometrics, Design Issues in Biometric Systems, InteroperabilityIssues, Economic and Social Aspects, Legal Challenges.	**8 Hours**

Unit-4:	Model of Cryptographic Systems, Issues in Documents Security, System of Keys, Public KeyCryptography, Digital Signature, Requirement of Digital Signature System, Finger Prints,Firewalls, Design and Implementation Issues, Policies, Network Security: Basic Concepts,Dimensions, Perimeter for Network Protection, Network Attacks, Need of Intrusion Monitoringand Detection, Intrusion Detection. Virtual Private Networks: Need, Use of Tunneling withVPN, Authentication Mechanisms, Types of VPNs and their Usage, Security Concerns in VPN.	**8 Hours**
Unit-5:	Laws, Investigation and Ethics: Cyber Crime, Information Security and Law, Types &Overview of Cyber Crimes, Cyber Law Issues in E-Business Management, Overview of Indian IT Act, Ethical Issues in Intellectual property rights, Copy Right, Patents, Data privacy andProtection, Domain Name, Software piracy, Plagiarism, Ethical hacking.	**8 Hours**
Text Books:	1Godbole,“ Information Systems Security”, Willey	
Reference Books:	1. Yadav, “Foundations of Information Technology”, New Age, Delhi 2. Schou, Shoemaker, “ Information Assurance for the Enterprise”, Tata McGraw Hill 3. Sood,“Cyber Laws Simplified”, McGraw Hill *** Latest editions of all the suggested books are recommended.**	
Additional Electronic Reference Material:	https://nptel.ac.in/courses/106/106/106106129/ https://www.youtube.com/watch?v=BvWvFAS1iP0	

Course Code:OECOP112	Concepts of IoT (Internet of Things)	L-3 T-0 P-0 C-3
Course Outcomes:	**On completion of the course, the students will be :**	
CO1.	Understanding the concepts of IOT	
CO2.	Understanding the architecture, different models and design principles of IOT.	
CO3.	Understanding the different technologies related to IOT.	
CO4.	Understanding the concepts of smart city development in IOT.	
CO5.	Applying IOT concepts in real word scenario like industrial automation, wireless communication etc.	
Course Content:		
Unit-1:	Introduction to Internet in general and Internet of Things: Introduction to Internet: layers, protocols, packets, services; Local Area Networks, MAC level, link protocols such as: point-to-point protocols, Ethernet, WiFi 802.11, cellular Internet access, and Machine-to-Machine (M2M).	**8 Hours**
Unit-2:	**IoT Technology Fundamentals:** IoT definitions: overview, applications, potential & challenges, and architecture; Devices and gateways, Local and wide area networking; Data management, Business processes in IoT, Everything as a Service(XaaS), IoT Analytics, Knowledge Management.	**8 Hours**
Unit-3:	**IoT-An Architectural Overview**– Building an architecture, Main design principles and needed capabilities, An IoT architecture outline, standards considerations. IoT examples: Case studies, e.g. sensor body-area-network and control of a smart home.	**8 Hours**
Unit-4:	**IoT Architecture-State of the Art –** Introduction, State of the art, **Architecture Reference Model-** Introduction, Reference Model and architecture, IoT reference Model; IoT Reference Architecture**:** Introduction, Functional View, Information View, Deployment and Operational View, Other Relevant architectural views.	**8 Hours**
Unit-5:	**Real-World Design Constraints-** Introduction, Technical Design constraints, Data representation and visualization, Interaction and remote control. Uses of IoT in Industrial Automation, Commercial Building Automation, Wireless communication, etc.	**8 Hours**
Text Books:	1. Jan Holler, Vlasios Tsiatsis, Catherine Mulligan, Stefan	

	Avesand, Stamatis Karnouskos, David Boyle, **"From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence",** 1st Edition, Academic Press, 2014.	
Reference Books:	1. Vijay Madisetti and Arshdeep Bahga, **"Internet of Things (A Hands-on-Approach)",** 1st Edition, VPT, 2014. 2. Francis daCosta, **"Rethinking the Internet of Things: A Scalable Approach to Connecting Everything",** 1st Edition, Apress Publications, 2013 *** Latest editions of all the suggested books are recommended.**	
Additional Electronic Reference Material:	https://www.digimat.in/nptel/courses/video/106105166/L01.html https://www.youtube.com/watch?v=p4xqO_QAv-w	