

**B.E. Semester –VIII**  
**Choice Based Credit Grading Scheme with Holistic Student Development (CBCGS-H 2019)**  
**Proposed Syllabus under Autonomy(w.e.f. A.Y. 2021-22)**

BE ( Computer Engineering )							SEM : V11I		
Course Name : Distributed Computing							Course Code : PEC-CS801		
Teaching Scheme (Program Specific)					Examination Scheme (Formative/ Summative)				
Modes of Teaching / Learning / Weightage					Modes of Continuous Assessment / Evaluation				
Hours Per Week					Theory (100)		Practical/Oral (25)	Term Work (25)	Total
Theory	Tutorial	Practical	Contact Hours	Credits	IS	ESE	PR	TW	150
3	-	2	5	4	25	75	25	25	
SA: In-Semester Assessment Paper Duration – 1.5 Hours									
ESE : End Semester Evaluation- Paper Duration - 3 Hours									
Mid Semester Assessment for Term work will be on continues basis									
Prerequisite: Engineering Mathematics									
RBT : Revised Bloom’s Taxonomy									

**Course Objectives:** The objective of the course is to study contemporary knowledge in distributed systems and able to analyze and design distributed applications. It provide skill to measure the performance of distributed synchronization algorithms

**Course Outcomes:** At the end of the course student should be able:

SN	Course Outcomes	RBT Levels
1	CO1: Demonstrate knowledge of the basic elements and concepts related to distributed system technologies.	L1,L2
2	CO2: Illustrate the middleware technologies that support distributed applications such as RPC, RMI and Object based middleware.	L1,L2,L3,L4 , L5,L6
3	CO3:Analyze the various techniques used for clock synchronization and mutual exclusion	L1,L2,L3,L4
4	CO4: Demonstrate the concepts of Resource and Process management and synchronization algorithms	L1,L2,L3,L4
5	CO5: Demonstrate the concepts of Consistency and Replication Management	L1,L2,L3,L4
6	CO6: Understand the knowledge of Distributed File System to analyze various file systems like NFS, AFS and experience in building large-scale distributed applications.	L1,L2

Module No.	Topics	Hrs.	RBT Levels
1	<b>Introduction to Distributed Systems</b> Characterization of Distributed Systems: Issues, Goals, and Types of distributed systems, Distributed System Models, Hardware concepts, Software Concept. Middleware: Models of Middleware, Services offered by middleware, Client Server model.	04	L1,L2
2	<b>Communication</b> Layered Protocols, Interprocess communication (IPC): MPI, Remote Procedure Call (RPC), Remote Object Invocation, Remote Method Invocation (RMI) Message Oriented Communication, Stream Oriented Communication, Group Communication	06	L1,L2,L3,L4,L5, L6
3	<b>Synchronization</b> Clock Synchronization, Logical Clocks, Election Algorithms, Mutual Exclusion, Distributed Mutual Exclusion-Classification of mutual Exclusion Algorithm, Requirements of Mutual Exclusion Algorithms, Performance measure Non Token based Algorithms: Lamport Algorithm, Ricart-Agrawala's Algorithm, Maekawa's Algorithm Token Based Algorithms: Suzuki-Kasami's Broadcast Algorithms, Singhal's Heuristic Algorithm, Raymond's Tree based Algorithm, Comparative Performance Analysis.	12	L1,L2,L3,L4
4	<b>Resource and Process Management</b> Desirable Features of global Scheduling algorithm, Task assignment approach, Load balancing approach, load sharing approach Introduction to process management, process migration, Threads, Virtualization, Clients, Servers, Code Migration	8	L1,L2,L3,L4
5	<b>Consistency, Replication and Fault Tolerance</b> Introduction to replication and consistency, Data-Centric and Client Centric Consistency Models, Replica Management Introduction to replication and consistency, Data-Centric and Client Centric Consistency Models, Replica Management	8	L1,L2,L3,L4
6	<b>Distributed File Systems and Name Services</b> Introduction and features of DFS, File models, File Accessing models, File-Caching Schemes, File Replication, Case Study: Distributed File Systems (DSF), Network File System (NFS), Andrew File System (AFS) Introduction to Name services and Domain Name System, Directory Services, Case Study: The Global Name Service, The X.500 Directory Service	7	L1,L2,L3,L4
<b>Total</b>		45	

### **Books and References:**

SN	Title	Authors	Publisher	Edition	Year
1	Distributed Systems: Principles and Paradigms	Andrew S. Tanenbaum and Maarten Van Steen	Pearson Education.	2 <sup>nd</sup> Edition	2007
2	Distributed Systems: Concepts and Design	George Coulouris, Jean Dollimore, Tim Kindberg	Pearson education	4th Edition	2005

### **Online Resources:**

S. No.	Website Name	URL	Modules Covered
1	www.cs.cmu.edu	www.cs.cmu.edu › slides › lec_3	M1
2	https://www.geeksforgeeks.org	https://www.geeksforgeeks.org/interprocess-communication-in-distributed-systems/	M2
3	www.tutorialspoint.com	https://www.tutorialspoint.com › Distributed-Systems	M1-M6

### **List of Practical/ Experiments:**

Practical Number	Type of Experiment	Practical/ Experiment Topic	Hrs.	RBT Levels
1	<b>Basic Experiments</b>	Study of Distributed Computing system architecture and explain with various application like university , Banking system	2	L1, L2, L3
2		Built a Program for Client/server using RPC/RMI	2	L1, L2, L3
3		Demonstrate a program for Inter-process communication	2	L1, L2, L3
4	<b>Design Experiments</b>	Develop a program for Group Communication	2	L1, L2, L3
5		Develop a program for Election Algorithm	2	L1, L2, L3
6		Develop a program for Clock Synchronization algorithms	2	L1, L2, L3
7		Design an program to illustrate token based algorithm	2	L1, L2, L3
8		a) Design an program to illustrate non token based algorithm b) Develop a program for Mutual Exclusion Algorithm	4	L1, L2, L3
9		a) Develop a program for Load Balancing Algorithm. b) Develop a program for Distributed File System	4	L1, L2, L3,
10	<b>Mini/Minor Projects/ Seminar/ Case Studies</b>	<b>Case study:</b> <ul style="list-style-type: none"> <li>Facebook Distributed file system</li> <li>Design And Development Of The Data Synchronization/Clock Synchronization</li> </ul>	8	L1, L2, L3,L4,L5,L6

		<ul style="list-style-type: none"> <li>CORBA Architecture</li> </ul> <b>Mini Project:</b> <ol style="list-style-type: none"> <li>Dynamic routing with security consideration Java Project</li> <li>Adaptive Programming Model for Fault Tolerant Distributed Computing Maze generator</li> <li>Distributed Cache Updated System for DSR Employee Record System</li> <li>Idea on Stock Market Simulation Game</li> <li>Project Idea on Replicated File System Distributed System on One Lane Bridge Project</li> </ol>		
<b>Total</b>			<b>30</b>	

**B.E. Semester –VIII**  
**Choice Based Credit Grading Scheme with Holistic Student Development (CBCGS-H 2019)**  
**Syllabus under Autonomy (w.e.f. A.Y. 2021-22)**

B.E. (Computer Engineering)							B.E. SEM: VIII			
Course Name: Graph Theory							Course Code: PEC-CS8011			
Teaching Scheme (Program Specific)					Examination Scheme (Formative/ Summative)					
Modes of Teaching / Learning / Weightage					Modes of Continuous Assessment / Evaluation					
Hours Per Week					Theory (100)		Practical/Oral (25)	Term Work (25)	Total	
Theory	Tutorial	Practical	Contact Hours	Credits	IA	ESE	PR/OR	TW	150	
3	-	2@	5	4	25	75	25	25		
IA: In-Semester Assessment - Paper Duration – 1 Hour										
ESE: End Semester Examination - Paper Duration - 3 Hours										
The weightage of marks for continuous evaluation of Term work/Report: Formative (40%), Timely completion of practical (40%) and Attendance / Learning Attitude (20%)										
Prerequisite: Discrete Mathematics, Algorithms, Data structures										

**Course Objective:** The objective of this course is to introduce students with the fundamental concepts in graph theory, explore its modern applications and to solve live problems that can be modeled by graphs.

**Course Outcomes:** Upon completion of the course students will be able to:

Sr. No	Course Outcome	Cognitive levels of attainment as per Bloom's Taxonomy
1	Solve problems using basic graph theory	L1, L2, L3, L4, L5, L6
2	Identify whether a graph has a Hamiltonian circuit or path and apply the concepts for problem solving.	L1, L2, L3, L4, L5, L6
3	Solve problems involving trees and connectivity and apply suitable graph model and algorithm for solving applications.	L1, L2, L3, L4, L5, L6
4	Represent Graphs in various forms and to introduce concepts like cut-set, cut-vertex, connectivity and separability.	L1, L2, L3, L4, L5, L6
5	Solve problems involving vertex and edge coloring	L1, L2, L3, L4, L5, L6
6	To explore modern applications of graph theory and apply principles and concepts of graph theory in practical situations	L1, L2, L3, L4, L5, L6



**Detailed Syllabus:**

Module No.	Topics	Hrs.	Cognitive levels of attainment as per Bloom's Taxonomy
1	<b>Introduction to Graph Theory</b>	7	L1, L2, L3, L4, L5, L6
	Introduction, Graph Terminologies, Types of Graphs, complete, regular and bipartite graphs, Isomorphic graphs, Subgraphs, Multi Graph Matrix representations of graphs, applications of graphs.		
2	<b>Paths and Circuits</b>	8	L1, L2, L3, L4, L5, L6
	Walks, trails, paths, cycles, Connected graphs, Euler Graphs, Hamiltonian Paths and circuits, Weighted graphs and shortest paths, Dijkstra's shortest path algorithm, Floyd-Warshall shortest path algorithm. Applications-The Chinese Postman Problem, The Travelling Salesman Problem		
3	<b>Trees and connectivity</b>	8	L1, L2, L3, L4, L5, L6
	Trees, Properties, Distance and Centers in a tree, Types: Rooted Tree and Binary tree, Labeled Tree, Unlabeled Tree, Spanning Trees, Kirchoff-matrix-tree theorem, Minimum spanning trees, Kruskal's algorithm, Prim's algorithm		
4	<b>Representations of Graphs</b>	7	L1, L2, L3, L4, L5, L6
	Fundamental Circuits, Cut Sets, Properties, Fundamental Circuit and Cut-sets, Connectivity and Separability, Matrix Representation, Adjacency matrix, Incidence matrix, Circuit matrix, Cut-set matrix, Path Matrix, Properties.		
5	<b>Vertex-colorings and planar graphs</b>	8	L1, L2, L3, L4, L5, L6
	Graph Coloring, Chromatic Number, Chromatic Polynomial, Chromatic Partitioning, Matching, Covering, Edge colorings, Planar Graphs: Basic concepts, Euler's formula and its consequences, Planarity testing, 5-Color-theorem		
6	<b>Applications of Graph Theory</b>	7	L1, L2, L3, L4, L5, L6
	Applications of Graphs in switching and coding Theory, Graphs in Game theory, Graphs in Computer programming and other application in Science and engineering.		
<b>Total Hours</b>		<b>45</b>	

**Books and References:**

SN	Title	Authors	Publisher	Edition	Year
1	“Graph Theory with Application to Engineering and Computer Science”,	Narsingh Deo	Prentice-Hall of India Pvt.Ltd	2 <sup>nd</sup> Edition	2003
2	“Graph Theory Applications”	L.R.Foulds	Springer ,.	2 <sup>nd</sup> Edition	2016
3	“Graph Theory with Applications”	Bondy, J. A. and Murty, U.S.R.,	North Holland Publication,	3 <sup>rd</sup> Edition,	2008.
4	Introduction to Graph Theory	West, D. B.	Pearson Education,.	2 <sup>nd</sup> Edition,	2011
5	“Graph Theory”,	Diestel, R,	Springer	3 <sup>rd</sup> Edition,	2006.
6	Graph Theory	J. A. Bondy and U. S. R. Murthy	Springer Verlag	7 <sup>th</sup> Edition	2008

**Online References:**

S. No.	Website Name	URL	Modules Covered
1	Introduction to Graph Theory, Coursera	<a href="https://www.coursera.org/learn/graphs#syllabus">https://www.coursera.org/learn/graphs#syllabus</a>	M1-M6
2	<a href="https://courses.lumenlearning.com/">https://courses.lumenlearning.com/</a>	<a href="https://courses.lumenlearning.com/math4liberalarts/chapter/introduction-euler-paths/">https://courses.lumenlearning.com/math4liberalarts/chapter/introduction-euler-paths/</a>	M1 - M6
3	Graph Theory, course on swayam portal	<a href="https://onlinecourses.nptel.ac.in/noc20_ma05/preview">https://onlinecourses.nptel.ac.in/noc20_ma05/preview</a>	M1-M6

**Capstone Project Hours Distribution**

Sr. No	Work to be done	No. of hours	Cognitive levels of attainment as per Bloom's Taxonomy
1	Identify an application of Graph (or a concept for demonstration of concepts)	2	L1,L2
2	Conduct a survey for usability	2	L1,L2
3	Representing and Drawing a Graph	2	L1,L2,L3
4	Project Design:(Design a prototype or mathematical model)	2	L1,L2,L3
5	Sample Implementation	2	L1,L2,L3
6	Model Research paper/demonstration of application	4	L1,L2,L3,L5,L6
7	Report Writing	4	L1,L2,L3,L4,L5,L6
8	Validate Modules	4	L1,L2,L3,L4
9	Test and Evaluate Modules	4	L1,L2,L3,L4
10	Prepare report	4	L1,L2,L3,L4
<b>Total Hours</b>		<b>30</b>	

**B.E. Semester –VIII**  
**Choice Based Credit Grading Scheme with Holistic Student Development (CBCGS-H 2019)**  
**Syllabus under Autonomy (w.e.f. A.Y. 2021-22)**

B.E. ( Computer Engineering )						B.E. SEM : VIII			
Course Name: Advanced System Security and Digital Forensics						Course Code: PEC-CS8012			
Teaching Scheme (Program Specific)					Examination Scheme (Formative/ Summative)				
Modes of Teaching / Learning / Weightage					Modes of Continuous Assessment / Evaluation				
Hours Per Week					Theory (100)		Practical/Oral (25)	Term Work (25)	Total
Theory	Tutorial	Practical	Contact Hours	Credits	IA	ESE	PR/OR	TW	150
3	-	2@	5	4	25	75	25	25	
IA: In-Semester Assessment - Paper Duration – 1 Hour									
ESE: End Semester Examination - Paper Duration - 3 Hours									
The weightage of marks for continuous evaluation of Term work/Report: Formative (40%), Timely completion of practical (40%) and Attendance/Learning Attitude (20%).									
Prerequisite: System Security									

**Course Objective:** The course intends to deliver advanced concepts about System Security to develop security management and policies for reducing Cyber-Attacks. It will also help in understanding and explore techniques used in Digital Forensics and analyze various software vulnerabilities, attacks and protection in Web Applications & Wi-Fi Networks

**Course Outcomes:** Upon completion of the course students will be able to:

Sr. No.	Course Outcomes	Cognitive levels of attainment as per Bloom's Taxonomy
1	Apply access control policies and control mechanisms to cyber-attacks	L1, L2, L3
2	Identify malicious code and targeted malicious code	L1, L2, L3
3	Analyze threats to web applications	L1, L2, L3, L4
4	Understand the vulnerabilities of Wi-Fi networks and explore different measures to secure wireless protocols, WLAN and VPN network	L1, L2, L3, L4
5	Asses ethical and legal issues associated with cyber-crimes and be able to mitigate impact of crimes with suitable policies	L1, L2, L3, L4, L5
6	Make use of different forensic tools to acquire and duplicate data from compromised systems and analyze the same	L1, L2, L3, L4



### Detailed Syllabus:

Module No.	Topics	Hrs.	Cognitive levels as per blooms Taxonomy
1	<b>Introduction &amp; Access Control</b>	8	L1, L2, L3
	Cyber-attacks, Vulnerabilities, Defense Strategies and Techniques, Authentication Methods and Protocols, Defense in Depth Strategies Access Control Policies: DAC, MAC, Multi-level Security Models: Biba Model, Bell La Padula Model		
2	<b>Program &amp; OS Security</b>	8	L1, L2, L3
	Malicious and Non-Malicious programming errors, Targeted Malicious codes: Salami Attack, Control against Program threats, Operating System Security: Memory and Address protection, File Protection Mechanism, Linux and Windows: Vulnerabilities, File System Security		
3	<b>Web Application Security</b>	10	L1, L2, L3, L4
	OWASP, Web Security Considerations, User Authentication and Session Management, SSL, Privacy on Web, Web Browser Attacks, Account Harvesting, Web Bugs, Clickjacking, Cross-Site Request Forgery, Session Hijacking and Management, Phishing and Pharming Techniques, Web Service Security, OAuth 2.0		
4	<b>Wireless Security</b>	6	L1, L2, L3, L4
	Wi-Fi Security, WEP, WPA, WPA-2, Mobile Device Security- Security Threats, Device Security, GSM and UMTS Security, IEEE 802.11/802.11i Wireless LAN Security, VPN Security		
5	<b>Legal and Ethical issues</b>	6	L1, L2, L3, L4, L5
	Cybercrime and its types, Intellectual property, Privacy, Ethical issues Protecting Programs and Data, Information and the Law, Rights of Employees and Employers, Redress for Software Failures, Computer Crime, Ethical Issues in Computer Security, Case studies of ethics		
6	<b>Digital Forensics</b>	7	L1, L2, L3, L4
	Introduction to Digital Forensics, Acquiring Volatile Data from Windows and Unix systems, Forensic Duplication Techniques, Analysis of forensic images using open source tools like Autopsy and SIFT, Investigating logs from Unix and Windows systems, Investigating Windows Registry		
	<b>Total Hours</b>	<b>45</b>	

### Books and References:

Sr. No.	Title	Authors	Publisher	Edition	Year
1.	Computer Security Principles and Practice	William Stallings	Pearson Education	Sixth Edition	2011
2.	Security in Computing	Charles P. fleeger	Pearson Education	Fifth Edition	2015
3.	Network Security and Cryptography	Bernard Menezes	Cengage Learning	Second Edition	2014
4.	Network Security Bible	Eric Cole	Wiley	Second Edition	2009

### Online Resources:

Sr. No.	Website Name	URL	Modules Covered
1.	<a href="https://www.owasp.org/index.php/Main_Page">https://www.owasp.org/index.php/Main_Page</a>	<a href="https://www.owasp.org/index.php/Category:OWASP_Top_Ten_Project">https://www.owasp.org/index.php/Category:OWASP_Top_Ten_Project</a>	M1-M2
2.	<a href="https://www.tutorialspoint.com/index.htm">https://www.tutorialspoint.com/index.htm</a>	<a href="https://www.tutorialspoint.com/operating_system/os_security">https://www.tutorialspoint.com/operating_system/os_security</a>	M2-M3
3.	<a href="https://www.tutorialspoint.com/index.htm">https://www.tutorialspoint.com/index.htm</a>	<a href="https://www.tutorialspoint.com/wireless_security/">https://www.tutorialspoint.com/wireless_security/</a>	M4
4.	<a href="https://pressbooks.com/">https://pressbooks.com/</a>	<a href="https://bus206.pressbooks.com/chapter/chapter-12-the-ethical-and-legal-implications-of-information-systems/">https://bus206.pressbooks.com/chapter/chapter-12-the-ethical-and-legal-implications-of-information-systems/</a>	M5
5.	<a href="https://www.open.edu/openlearn/">https://www.open.edu/openlearn/</a>	<a href="https://www.open.edu/openlearn/science-maths-technology/digital-forensics/content-section-4.3">https://www.open.edu/openlearn/science-maths-technology/digital-forensics/content-section-4.3</a>	M6

### Mini Project:

Sr. No.		Hrs.	Cognitive levels as per blooms Taxonomy
1	Study various Network Scanning Tools for acquiring information	2	L1, L2
2	Identify common vulnerabilities in computing systems / web applications / web sites	4	L1, L2
3	Perform vulnerability scanning using tools like Nessus	2	L1, L2, L3
4	Analyze web-application vulnerabilities using open source tools like Wapiti, browser exploitation framework (BeEf), etc.	2	L1, L2, L3
5	Identify SQL injection vulnerabilities in a website database using SQLMap	2	L1, L2, L3
6	Analyze static code using open source tools like RATS, Flawfinder etc	2	L1, L2, L3, L4
7	Make use of forensics tools in Kali Linux for acquiring data	2	L1, L2, L3
8	Make use of forensics tools in Kali Linux for analyzing data	2	L1, L2, L3
9	Make use of forensics tools in Kali Linux for duplicating data	2	L1, L2, L3
10	Analyze forensic images using open source tools like Autopsy, SIFT, FKT Imager	2	L1, L2, L3
11	Design mitigation technique for the identified vulnerability	4	L1, L2, L3, L4
12	Implement mitigation techniques	4	L1, L2, L3, L4
<b>Total Hours: 30</b>			

**B.E. Semester –VIII**  
**Choice Based Credit Grading Scheme with Holistic Student Development (CBCGS-H 2019)**  
**Syllabus under Autonomy (w.e.f. A.Y. 2021-22)**

B. E (Computer Engineering)							B.E. SEM : VIII		
Course Name :Data Science							Course Code :PEC-CS8013		
Teaching Scheme (Program Specific)					Examination Scheme (Formative/ Summative)				
Modes of Teaching / Learning / Weightage					Modes of Continuous Assessment / Evaluation				
Hours Per Week					Theory (100)		Practical/Oral (25)	Term Work (25)	Total
Theory	Tutorial	Practical	Contact Hours	Credits	IA	ESE	PR/OR	TW	150
3	-	2@	5	4	25	75	25	25	
IA: In-Semester Assessment - Paper Duration – 1.5 Hour									
ESE: End Semester Examination - Paper Duration - 3 Hours									
The weightage of marks for continuous evaluation of Term work/Report: Formative (40%), Timely completion of practical (40%) and Attendance / Learning Attitude (20%)									
Prerequisite: Computer Basics, Procedural Programming Languages, Probability									

**Course Objective:** The objective of this course is to impart necessary knowledge of the mathematical foundations needed for data science and develop programming skills required to build data science applications.

**Course Outcomes:** Upon completion of the course students will be able to:

SN	Course Outcomes	Cognitive levels of attainment as per Bloom's Taxonomy
1	Understand the complexities of various Challenges in Data Science	L1, L2
2	Apply Data Science Tools to real life Examples.	L1, L2, L3
3	Demonstrate understanding of the mathematical foundations needed for data science	L1, L2, L3
4	Apply and analyze the complexity of Data Management and Data Science algorithms	L1, L2, L3, L4
5	Demonstrate Data Visualization Techniques.	L1, L2, L3
6	Discuss applications of Data Science for real life applications	L1, L2

**Detailed Syllabus:**

Module No.	Topics	Hrs.	Cognitive levels of attainment as per Bloom's Taxonomy
1	<b>Introduction to Data Science Key Concepts</b>	5	L1, L2
	Introduction, Terminology, Traits of Big data, Web Scraping, Analysis vs Reporting, Data Science process, Types of data, Example applications.		
2	<b>Introduction to Programming Tools for Data Science</b>	6	L1, L2, L3
	Toolkits using Python: Matplotlib, NumPy, Scikit-learn, NLTK Visualizing Data: Bar Charts, Line Charts, Scatterplots Working with data: Reading Files, Scraping the Web, Using APIs (Example: Using the Twitter APIs), Cleaning and Munging, Manipulating Data, Rescaling, Dimensionality Reduction		
3	<b>Mathematical Foundations</b>	12	L1, L2, L3
	Statistics: Sample Selection, Describing and Summarizing Data, Descriptive Statistics: Describing Qualitative and Quantative Data, Histograms Probability: Dependence and Independence, Conditional Probability, Bayes's Theorem, Random Variables, Continuous Distributions, The Normal Distribution, The Central Limit Theorem Hypothesis and Inference: Statistical Hypothesis Testing, Confidence Intervals, P-hacking, Bayesian Inference		
4	<b>Data Management, Pre-processing, Exploratory Data Analysis and Statistical Techniques</b>	10	L1, L2, L3, L4
	Data collection and management: Introduction, Sources of data, Data collection and APIs, Recent trends in various data collection and analysis techniques, Exploring and fixing data, Data storage and management, Using multiple data Sources, Exploratory Data Analysis, Linear Discriminant analysis (LDA), Logistic regression: Bayesian logistic regression		
5	<b>Data Visualization</b>	6	L1, L2, L3
	Data Visualization: Introduction, Types of data visualization, Data for visualization: Data types, Data encodings, Retinal variables, Mapping variables to encodings, Visual encodings, Technologies for visualization, Bokeh (Python)		
6	<b>Applications of Data Science</b>	6	L1, L2
	Applications of Data Science, Recommendation System, Predictive Analytics, Text Mining, Sentiment Analysis and Case studies		
	<b>Total Hours</b>	<b>45</b>	

### **Books and References:**

	Title	Authors	Publisher	Edition	Year
1	Data Science from Scratch: First Principles with Python	Joel Grus	O'Reilly Media	First Edition	2015
2	Data Sciences	Jain V.K	Khanna Publishing House	First Edition	2018
3	Data Visualization – A Practical Introduction	Kieran Healy	Princeton Univ.	-	2019
4	The Data Science Handbook	Field Cady	Wiley	--	2018

### **Online Resources:**

S. No.	Website Name	URL	Modules Covered
1	<a href="https://towardsdatascience.com">https://towardsdatascience.com</a>	<a href="https://towardsdatascience.com">https://towardsdatascience.com</a>	M1-M6
2	<a href="http://www.coursera.org">www.coursera.org</a>	<a href="https://www.coursera.org/learn/open-source-tools-for-data-science/">https://www.coursera.org/learn/open-source-tools-for-data-science/</a>	M2
3	<a href="http://www.tutorialspoint.com">www.tutorialspoint.com</a>	<a href="https://www.javatpoint.com/what-is-data-visualization">https://www.javatpoint.com/what-is-data-visualization</a>	M5

### **Calendar for MiniProject**

Work to be done	Hrs.
Project Title Identification with understanding of Business	2
Data Gathering	2
Data Exploration and Cleaning	6
Model Data	8
Interpret Data	6
Testing of Mini Project	2
Preparation of Report	4
<b>Total Hours</b>	<b>30</b>



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**Syllabus under Autonomy (w.e.f. A.Y. 2021-22)**

B.E. (Computer Engineering)							B.E. SEM: VIII			
Course Name: Augmented and Virtual Reality							Course Code: PEC-CS8014			
Teaching Scheme (Program Specific)					Examination Scheme (Formative/ Summative)					
Modes of Teaching / Learning / Weightage					Modes of Continuous Assessment / Evaluation					
Hours Per Week					Theory (100)		Practical/Oral (25)	Term Work (25)	Total	
Theory	Tutorial	Practical	Contact Hours	Credits	IA	ESE	PR/OR	TW	150	
3	-	2@	5	4	25	75	25	25		
IA: In-Semester Assessment - Paper Duration – 1.5 Hours ESE: End Semester Examination - Paper Duration - 3 Hours The weightage of marks for continuous evaluation of Term work/Report: Formative (40%), Timely completion of practical (40%) and Attendance / Learning Attitude (20%)										
Prerequisite: Computer Graphics										

**Course Objective:** To provide background in perception to educate VR creators on concepts and theories of how we perceive and interact with the world around us

**Course Outcomes:** Upon completion of the course students will be able to

Sr. No.	Course Outcomes	Cognitive levels of attainment as per Bloom's Taxonomy
1	Apply the concepts of VR and AR in real life	L1, L2, L3
2	Reduce the greatest risk to VR	L1, L2, L3
3	Design the way users interact within the scenes they find themselves in	L1, L2, L3
4	Exposed to VR, AR and today's resources	L1, L2, L3, L4
5	Effectively use open source VR software.	L1, L2, L3
6	Understand different types Modeling techniques of VR	L1, L2

**Detailed Syllabus:**

Module No.	Topics	Hrs .	Cognitive levels of attainment as per Bloom's Taxonomy
1	<b>Introduction to Virtual Reality</b>	7	L1, L2, L3
	Introduction: What Is Virtual Reality, A History of VR, An Overview of Various Realities, Immersion, Presence, and Reality Trade-Offs, The Basics: Design Guidelines, Objective and Subjective Reality, Perceptual Models and Processes, Perceptual Modalities		
2	<b>Virtual Reality Perception</b>	7	L1, L2, L3
	Perception of Space and Time, Perceptual Stability, Attention, and Action, Perception: Design Guidelines, Adverse Health Effects, Motion Sickness, Eye Strain, Seizures, and Aftereffects, Hardware Challenges, Latency, Measuring Sickness, Reducing Adverse Effects, Adverse Health Effects: Design Guidelines		
3	<b>Virtual Reality Interaction</b>	8	L1, L2, L3
	Content Creation, Concepts of Content Creation, Environmental Design, Affecting Behavior, Transitioning to VR Content Creation, Content Creation: Design Guidelines, Interaction, Human-Centered Interaction, VR Interaction Concepts, Input Devices, Interaction Patterns and Techniques, Interaction: Design Guidelines		
4	<b>Virtual and Augmented Reality</b>	7	L1, L2, L3, L4
	Design and Art Across Digital Realities, Designing for Our Senses, Virtual Reality for Art, 3D Art Optimization, Computer Vision That Makes Augmented Reality Possible Works, Virtual Reality and Augmented Reality: Cross-Platform Theory		
5	<b>Virtual Reality Toolkit</b>	8	L1, L2, L3
	Virtual Reality Toolkit: Open Source Framework for the Community, Data and Machine Learning Visualization Design and Development in Spatial Computing, Character AI and Behaviors, The Virtual and Augmented Reality Health Technology Ecosystem		
6	<b>Virtual Reality Modeling</b>	8	L1, L2
	VR Modeling and Programming Geometric Modeling: Virtual Object Shape, Object Visual Appearance. Kinematics Modeling: Object Position, Transformation Invariants, Object Hierarchies, Physical Modeling: Collision Detection, Surface Deformation, Force Computation. Behavior Modeling. Programming through VRML/X3D: Defining and Using Nodes and Shapes, VRML Browsers, Java 3D, OpenCV for augmented reality		
<b>Total Hours</b>		<b>45</b>	

### **Books and References:**

SN	Title	Authors	Publisher	Edition	Year
1	The VR Book, Human Centered Design for Virtual Reality	Jason Jerald	ACM Books	First	2016
2	Creating Augmented and Virtual Realities	Erin Pangilinan, Steve Lukas, Vasanth Mohan	O'Reilly	First	2019
3	Virtual reality with VRTK4	Rakesh Baruah	APress	First	2020

### **Online References:**

S. No.	Website Name	URL	Modules Covered
1	Courser.org	<a href="https://www.coursera.org/courses?query=augmented%20reality">https://www.coursera.org/courses?query=augmented%20reality</a>	M1 – M6
2	Maacindia.com	<a href="http://maacindia.com/ar-vr-courses/var-plus.aspx">maacindia.com/ar-vr-courses/var-plus.aspx</a>	M4, M5, M6
3	Arenaanimation.com	<a href="http://arenaanimationgoregaon.in/">http://arenaanimationgoregaon.in/</a>	M1, M2, M3

### **Mini Project Hours Distribution:**

Sr. No	Work to be done	No. of Hours	Cognitive levels of attainment as per Bloom's Taxonomy
1	Augmented Reality- Adding 3d Character	4	L1, L2
2	Touchless ATM using Augmented Reality	2	L1, L2
3	Game Development with Augmented Reality	2	L1, L2
4	Augmented reality in Application Development	4	L1, L2, L3
5	Augmented Reality Search Project	2	L1, L2, L3
6	Medical trainings and healthcare	2	L1, L2, L3, L4
7	Advertisement and promotion	6	L1,L2,L3,L4
8	Classroom education	4	L1,L2,L3,L4, L5
9	Security Purpose	4	L1, L2
	Total Hours	30	

**B.E. Semester –VIII**  
**Choice Based Credit Grading Scheme with Holistic Student Development (CBCGS-H 2019)**  
**Syllabus under Autonomy (w.e.f. A.Y. 2021-22)**

B.E. ( Computer Engineering )						S.E. SEM : VIII			
Course Name : Natural Language Processing						Course Code : PEC-CS8015			
Teaching Scheme (Program Specific)					Examination Scheme (Formative/ Summative)				
Modes of Teaching / Learning / Weightage					Modes of Continuous Assessment / Evaluation				
Hours Per Week					Theory (100)		Practical/Oral (25)	Term Work (50)	Total
Theory	Tutorial	Practical	Contact Hours	Credits	IA	ESE	PR/OR	TW	150
3	-	2@	5	4	25	75	25	25	
IA: In-Semester Assessment - Paper Duration – 1.5 Hours ESE: End Semester Examination - Paper Duration - 3 Hours The weightage of marks for continuous evaluation of Term work/Report: Formative (40%), Timely completion of practical (40%) and Attendance / Learning Attitude (20%)									
Prerequisite: Programming Language Basic, Compiler Concepts									

**Course Objective:** Course should be able to deliver fundamental knowledge of Natural Language Processing and applying knowledge to implement real time problems in fields of natural languages.

**Course Outcomes:** Upon completion of the course students will be able to:

SN	Course Outcomes	Cognitive levels of attainment as per Bloom's Taxonomy
1	Able to Understand field of natural language processing.	L1, L2
2	Able to Analyze capabilities and limitations of current natural language technologies,	L1, L2, L3, L4
3	Able to apply the model linguistic phenomena with formal grammars.	L1, L2, L3, L4
4	Be able to Analyze and test algorithms for NLP problems	L1, L2, L3, L4
5	Able to Understand the mathematical and linguistic foundations underlying approaches to the various areas in NLP	L1, L2
6	Able to apply NLP techniques to design real world NLP applications such as machine translation, text categorization, text summarization, information extraction...etc.	L1, L2,L3

### Detailed Syllabus:

Module No.	Topics	Hrs.	Cognitive levels of attainment as per Bloom's Taxonomy
1	<b>Introduction to Natural Language Processing</b>	5	L1, L2
	Introduction, History, Phases, Ambiguity, challenges of NLP, Applications of NLP		
2	<b>Word Level Analysis</b>	6	L1, L2, L3
	Morphology analysis, Inflectional morphology & Derivational morphology, Stemming and Lemmatization, Regular expression, finite automata, finite state transducers (FST) N-gram language model: Introduction and Applications		
3	<b>Syntax Analysis</b>	9	L1, L2, L3
	Part-Of-Speech tagging (POS)- Tag set for English (Penn Treebank), Rule based POS tagging, Stochastic POS tagging, Introduction to CFG, Hidden Markov Model (HMM), Conditional Random Field (CRF).		
4	<b>Semantic Analysis</b>	10	L1, L2, L3
	Lexical Semantics: Introduction, Relations among lexemes & their senses –Homonymy, Polysemy, Synonymy, Hyponymy, WordNet, Robust Word Sense Disambiguation (WSD)		
5	<b>Pragmatics</b>	8	L1, L2
	Pragmatics analysis, Aspects, Discourse reference resolution, reference phenomenon, Syntactic and semantic constraints		
6	<b>Applications of NLP</b>	7	L1, L2, L3, L4
	Machine translation, Information retrieval, Question answers system, Text categorization and summarization, sentiment analysis, Named Entity Recognition.		
<b>Total Hours</b>		<b>45</b>	

### Books and References:

	Title	Authors	Publisher	Edition	Year
1	Speech and Language Processing	Daniel Jurafsky, James H. Martin	Prentice Hall	Third Edition	2008
2	Foundations of Statistical Natural Language Processing	Christopher D. Manning and Hinrich Schutze,	MIT Press, 1999	Second Edition	1999
3	Natural Language Processing and Information Retrieval	Siddiqui and Tiwary U.S	, Oxford University Press	--	2008



4	Multilingual natural language processing applications	Daniel M Bikel and Imed Zitouni —	Peasron	--	2013
5	Natural Language Processing with Python	Steven Bird, Ewan Klein,	O'Reilly	--	--

### Online Resources:

S. No.	Website Name	URL	Modules Covered
1	www.geeksforgeeks.org	<a href="https://www.geeksforgeeks.org/fundamentals-of-algorithms/#AnalysisofAlgorithms">https://www.geeksforgeeks.org/fundamentals-of-algorithms/#AnalysisofAlgorithms</a>	M1-M6
2	www.tutorialspoint.com	<a href="https://www.tutorialspoint.com/design_and_analysis_of_algorithms/index.htm">https://www.tutorialspoint.com/design_and_analysis_of_algorithms/index.htm</a>	M1-M3, M6
3	www.w3schools.in	<a href="https://www.w3schools.in/category/data-structures-tutorial/">https://www.w3schools.in/category/data-structures-tutorial/</a>	M1,M4

### Calendar for MiniProject

Work to be done	Hrs.
Project Title Identification with understanding of Business	2
Data Gathering	2
Data Exploration and Cleaning	6
Model Data	8
Interpret Data	6
Testing of Mini Project	2
Preparation of Report	4
<b>Total Hours</b>	<b>30</b>

**B.E. Semester –VIII**  
**Choice Based Credit Grading Scheme with Holistic Student Development (CBCGS-H 2019)**  
**Syllabus under Autonomy (w.e.f. A.Y. 2021-22)**

B.E. (Computer Engineering)					B.E. Open Elective SEM : VIII				
Course Name: Project Management					Course Code : OEC-CS8011				
Teaching Scheme (Program Specific)					Examination Scheme (Formative/ Summative)				
Modes of Teaching / Learning / Weightage					Modes of Continuous Assessment / Evaluation				
Hours Per Week					Theory (100)		Practical/Oral (25)	Term Work (25)	Total
Theory	Tutorial	Practical	Contact Hours	Credits	IA	ESE	PR/OR	TW	
3	-	-	3	3	25	75	-	-	100
<b>IA: In-Semester Assessment - Paper Duration – 1 Hours</b> <b>ESE: End Semester Examination - Paper Duration - 3 Hours</b> <b>The weightage of marks for continuous evaluation of Term work/Report: Formative (40%), Timely completion of practical (40%) and Attendance / Learning Attitude (20%)</b>									
<b>Prerequisite: Data Structure, Software Engineering</b>									

**Course Objective:** The objective of the course is to familiarize the students with the use of a structured methodology/approach for each and every unique project undertaken, including utilizing project management concepts, tools and techniques and appraise the students with the project management life cycle and make them knowledgeable about the various phases from project initiation through closure.

**Course Outcomes:** Upon completion of the course students will be able to:

Sr No.	Course Outcomes	Cognitive levels of attainment as per Bloom's Taxonomy
1	Apply selection criteria and select an appropriate project from different options	L1, L2, L3, L4
2	Write work break down structure for a project and develop a schedule based on it	L1, L2, L3, L4
3	Identify opportunities and threats to the project and decide an approach to deal with them strategically.	L1, L2, L3, L4
4	Use Earned value technique and determine & predict status of the project.	L1, L2, L3, L4
5	Compare and contrast various project execution, Monitoring and Controlling Projects, Project Contracting, Project Leadership and Ethics and Closing the Project	L1, L2, L3, L4
6	Capture lessons learned during project phases and document them for future reference	L1, L2

**Detailed Syllabus:**

Module No.	Topics	Hr s.	Cognitive levels of attainment as per Bloom's Taxonomy
1	<b>Project Management Foundation</b>	6	L1, L2, L3, L4
	Definition of a project, Project Vs Operations, Necessity of project management, Triple constraints, Project life cycles (typical & atypical) Project phases and stage gate process. Role of project manager, Negotiations and resolving conflicts, Project management in various organization structures, PM knowledge areas as per Project Management Institute (PMI).		
2	<b>Initiating Projects</b>	6	L1, L2, L3, L4
	How to get a project started, Selecting project strategically, Project selection models (Numeric /Scoring Models and Non-numeric models), Project portfolio process, Project sponsor and creating charter; Project proposal. Effective project team, Stages of team development & growth (forming, storming, norming & performing), team dynamics		
3	<b>Project Planning and Scheduling</b>	8	L1, L2, L3, L4
	Work Breakdown structure (WBS) and linear responsibility chart, Interface Co-ordination and concurrent engineering, Project cost estimation and budgeting, Top down and bottoms up budgeting, Networking and Scheduling techniques. PERT, CPM, GANTT chart, Introduction to Project Management Information System (PMIS).		
4	<b>Planning Projects</b>	8	L1, L2, L3, L4
	Crashing project time, Resource loading and levelling, Goldratt's critical chain, Project Stakeholders and Communication plan Risk Management in projects: Risk management planning, Risk identification and risk register, Qualitative and quantitative risk assessment, Probability and impact matrix. Risk response strategies for positive and negative risks		
5	<b>Executing Projects, Monitoring and Controlling Projects &amp; Project Contracting</b>	10	L1, L2, L3, L4
	5.1 Executing Projects: Planning monitoring and controlling cycle, Information needs and reporting, engaging with all stakeholders of the projects, Team management, communication and project meetings 5.2 Monitoring and Controlling Projects: Earned Value Management techniques for measuring value of work completed; Using milestones for measurement; change requests and scope creep, Project audit. 5.3 Project Contracting : Project procurement management, contracting and outsourcing,		
6	<b>Project Leadership and Ethics &amp; Closing the Project</b>	7	L1, L2
	6.1 Project Leadership and Ethics: Introduction to project leadership, ethics in projects, Multicultural and virtual projects 6.2 Closing the Project: Customer acceptance; Reasons of project termination, Various types of project terminations (Extinction, Addition, Integration, Starvation), Process of project termination, completing a final report; doing a lessons learned analysis; acknowledging successes and failures; Project management templates and other resources; Managing without authority; Areas of further study.		
<b>Total Hours</b>		<b>45</b>	

**Books and References:**

S.No	Title	Authors	Publisher	Edition	Year
1	Project Management Foundation:	Project Management: A managerial approach, Jack Meredith & Samuel Mantel.	Wiley India	Seventh Edition	2009
2	Initiating Projects & Project Planning and Scheduling	A Guide to the Project Management Body of Knowledge (PMBOK® Guide)	Project Management Institute PA, USA	Fifth Edition	--
3	Planning Projects	Project Management, Gido Clements	Cengage Learning	--	--
4	Executing Projects, Monitoring and Controlling Projects & Project Contracting	Project Management, Gopalan Wiley India	Wiley India	--	--
5	Project Leadership and Ethics & Closing the Project	Project Management, Dennis Lock.	Gower Publishing England	Ninth Edition	--

**Online Resources:**

S. No.	Website Name	URL	Modules Covered
1	<a href="http://www.opentextbooks.org.hk">http://www.opentextbooks.org.hk</a>	<a href="http://www.opentextbooks.org.hk/system/files/export/15/15694/pdf/Project_Management_15694.pdf">http://www.opentextbooks.org.hk/system/files/export/15/15694/pdf/Project_Management_15694.pdf</a>	M1-M6
2	<a href="https://www.nesacenter.org">https://www.nesacenter.org</a>	<a href="https://www.nesacenter.org/uploaded/conferences/SEC/2014/handouts/Rick_Detwiler/15_Detwiler_Resources.pdf">https://www.nesacenter.org/uploaded/conferences/SEC/2014/handouts/Rick_Detwiler/15_Detwiler_Resources.pdf</a>	M1-M3, M6
3	<a href="http://www.edo.ca">http://www.edo.ca</a>	<a href="http://www.edo.ca/downloads/project-management.pdf">http://www.edo.ca/downloads/project-management.pdf</a>	M1,M4

**B.E. Semester –VIII**  
**Choice Based Credit Grading Scheme with Holistic Student Development (CBCGS-H 2019)**  
**Syllabus under Autonomy (w.e.f. A.Y. 2021-22)**

B.E. (Computer Engineering)							BE Open Elective (SEM: VIII)		
Course Name: Energy Audit and Management							Course Code: OEC-CS8012		
Teaching Scheme (Program Specific)					Examination Scheme (Formative/ Summative)				
Modes of Teaching / Learning / Weightage					Modes of Continuous Assessment / Evaluation				
Hours Per Week					Theory (100)		Practical/Oral (25)	Term Work (25)	Total
Theory	Tutorial	Practical	Contact Hours	Credits	IA	ESE	PR	TW	100
3	-	-	3	3	25	75	-	-	
<div>IA: In-Semester Assessment - Paper Duration – 1.5 Hours</div> <div>ESE: End Semester Examination - Paper Duration - 3 Hours</div> <div>The weightage of marks for continuous evaluation of Term work/Report: Formative (40%), Timely completion of practical (40%) and Attendance / Learning Attitude (20%)</div>									
Prerequisite: - Knowledge of Basic Electrical and Mechanical Systems									

**Course objectives:**

To understand the importance energy security for sustainable development and the fundamentals of energy conservation. To introduce performance evaluation criteria of various electrical and thermal installations to facilitate the energy management. To relate the data collected during performance evaluation of systems for identification of energy saving opportunities.

**Course outcomes:** After successful completion of the course student will be able:-

SN	Course Outcomes	Cognitive levels of attainment as per Bloom's Taxonomy
1	To identify and describe present state of energy security and its importance.	L1
2	To identify and describe the basic principles and methodologies adopted in energy audit of any utility.	L1, L2, L3
3	To describe the energy performance evaluation of some common electrical installations and identify the energy saving opportunities.	L1, L2, L3, L4
4	To describe the energy performance evaluation of some common thermal installations and identify the energy saving opportunities	L1, L2, L3, L4
5	To analyze the data collected during performance evaluation and recommend energy saving measures	L1, L2, L3
6	To understand the concept of Energy conservation measures in building complex	L1



### Detailed Syllabus

Module No.	Unit No.	Topics	Hrs	Cognitive levels of attainment as per Bloom's Taxonomy
1	<b>Energy Scenario &amp; Energy Conservation measures</b>		04	L1
	1.1	Present Energy Scenario		
	1.2	Renewable and Non-Renewable form of Energy		
	1.3	Greenhouse Gas effect, Acid Rain, Energy Pricing, Energy Sector Reforms,		
	1.4	Energy Conservation and its Importance: Energy Conservation Act-2001 and its features. Role of Bureau of Energy Efficiency (BEE), Energy Security, Basic idea of Material and Energy balance		
2	<b>Energy Audit &amp; Energy Economics</b>		08	L1, L2, L3
	2.1	Energy Audit: Definition, need, types of energy audit, Steps of detailed Energy Audit, Role of Energy Manager and Internal audit Team,		
	2.2	Measuring instruments & Equipment used during Energy audit		
	2.3	Understanding energy costs, Bench marking, Energy performance, Matching energy use to requirement,		
	2.4	Maximizing system efficiencies, Optimizing the input energy requirements, Fuel and energy substitution		
	2.5	Elements of monitoring & targeting, Data and information analysis.		
	2.6	Energy Economics: Simple payback period (SPP), Net Present value (NPV), Return on investment (ROI), Internal rate of return (IRR)		
3	<b>Energy Management in Electrical System</b>		10	L1, L2, L3, L4
	3.1	Electricity billing, Basic concept of Electrical load management, Maximum demand Control, Energy management through Power factor improvement		
	3.2	Energy efficient equipment and appliances, Star ratings of Electrical Equipment.		
	3.3	Lighting System control: Occupancy sensors, daylight integration, and use of intelligent controllers. Energy efficiency measures in lighting system		
	3.4	Energy conservation opportunities in water pumps, industrial drives, induction motors, soft starters, variable speed drives.		
4	<b>Energy Management in Thermal Systems</b>		10	L1, L2, L3, L4
	4.1	Review of different thermal loads, Steam System: Basic idea of Steam distribution system, Assessment of steam distribution losses, Steam leakages, Steam trapping, Condensate and flash steam recovery system, Energy conservation in Steam distribution system,		

	4.2	Boiler System: General fuel conservation measures in Boilers and furnaces, Waste heat recovery, cogeneration, use of insulation- types and application.		
	4.3	HVAC system: Coefficient of performance, Capacity, factors affecting performance of Refrigeration and Air Conditioning system performance, Energy savings opportunities in HVAC system.		
5	<b>Energy Performance Assessment</b>		04	L1, L2, L3,
	5.1	Performance assessment of Motors, variable speed drive, pumps,		
	5.2	Lighting System calculations: Installed Load Efficacy Ratio (ILER) method,		
	5.3	HVAC system calculations; various terms used in assessment of performance		
6	<b>Energy conservation in Residential and Commercial Buildings</b>		03	L1
	6.1	Energy Conservation Building Codes (ECBC)		
	6.2	Green Building norms, LEED ratings of buildings, Use of renewable energy sources in building complex		
		Total	39	

### Books of Reference

SN	Title	Authors	Publisher
1.	Handbook of Electrical Installation Practice	Geofry Stokes	Blackwell Science
2.	Designing with light: Lighting System Handbook	By Anil Valia	-
3.	Energy Management handbook	W.C. Turner	John Wiley and Sons
4.	Handbook on Energy Audits and Management	A. K. Tyagi,	Tata Energy Research Institute (TERI).
5.	Energy Management Principles	C.B. Smith	Pergamon Press
6.	Energy Conservation Guidebook	Dale R. Patrick, S. Fardo, Ray E. Richardson	Fairmont Press
7.	Handbook of Energy Audits	Albert Thumann, W. J. Younger, T. Niehus	CRC Press

### Online Reference

SNo.	Website Name	URL	Modules Covered
1	Bureau of Energy Efficiency	<a href="https://beeindia.gov.in/content/energy-auditors">https://beeindia.gov.in/content/energy-auditors</a>	1-2
2	You tube	<a href="https://youtube/7hDyLuFJ0c8">https://youtube/7hDyLuFJ0c8</a>	1-6
3	You tube	<a href="https://www.youtube.com/watch?v=UhGZRoUlr8U">https://www.youtube.com/watch?v=UhGZRoUlr8U</a>	1-6
4	NPTEL by IIT Roorkee	<a href="https://www.youtube.com/watch?v=2zWt-pBCU2I">https://www.youtube.com/watch?v=2zWt-pBCU2I</a>	1-3

**B.E. Semester –VIII**  
**Choice Based Credit Grading Scheme with Holistic Student Development (CBCGS-H 2019)**  
**Syllabus under Autonomy (w.e.f. A.Y. 2021-22)**

B.E. (Computer Engineering)							B.E. Open Elective SEM VIII				
Course Name : Innovation Management							Course Code : OEC-CS8013				
Contact Hours Per Week : 3							Credits : 3				
Teaching Scheme (Program Specific)					Examination Scheme (Formative/ Summative)						
Modes of Teaching / Learning / Weightage					Modes of Continuous Assessment / Evaluation						
Hours Per Week					Theory (100)		Practical/Oral/Presentation (25)		Term Work (25)		Total
Theory	Tutorial	Practical	Contact Hours	Credits	IA	ESE	PR		TW		100
3	-	-	3	3	25	75	-	-	-	-	
ISA: In-Semester Assessment - Paper Duration – 1 hr ESE: End Semester Evaluation-Paper Duration-3 hrs.											
Prerequisite: Financial Accounting and Management and Business Modelling. RBT : Revised Bloom’s Taxonomy											

**Course Objective:** The course intends to apply the concept of Innovation in Business.

**Course Outcomes:** Upon completion of the course students will be able to:

**L1:** Remembering **L2:** Understanding **L3:** Applying **L4:** Analysing **L5:** Evaluating **L6:** Creating

<b>Sr. No.</b>	<b>Course Outcomes</b>	<b>RBT level</b>
1	Able to analyze and apply impact of innovation on society	L1,L2,L4
2	Able to understand the role of technology in creating wealth	L1,L2,L3
3	Recognize markers of business models which appear as a response to digital revolution	L1,L2,L3,L4
4	Search for real cases which represent new business models	L1,L2,L3,L4
5	Identify similar and distinguished features of business build on identical business models	L1,L2,L3,L4
6	Know the most important cases of data-driven business founded on new business models	L2,L4

### Detailed Syllabus

Module No.	Topics	Hrs.	RBT Levels
01	<b>Sources of Innovation</b>	08	L1,L2,L4
	Sources of Innovation: Innovation / wealth creation process, three critical trajectories impacting the innovation process creative transformations, the importance of technological Innovation, The impact of technological innovation on society. Case study on impact of technological innovation on society. Industry dynamics of technological innovation, transcending creativity into innovation, innovation as a collaborative effort.		
02	<b>Types and patterns of innovation</b>	06	L1,L2,L3
	Types and patterns of innovation: Technology S curves, formulation of technological innovation strategy, implementing technological innovation strategies. Managing new product development. Case study on new product development.		
03	<b>Collaboration strategies and Choosing innovative projects</b>	08	L1,L2,L3,L4
	Collaboration Strategies: The role of technology in the creation of wealth, historical perspective, long-wave cycle, evolution of production technology, technology and national economy. Case study on Collaboration Strategies. Choosing innovative projects: Management of technology, the conceptual frame work, technology and society, knowledge and technology, technology and business. Case study on How to choose innovative projects.		
04	<b>Introduction to Business Models</b>	8	L1,L2,L3,L4
	What is a Business Model? Importance of Business Model. History of Business Model. Type of Business Model		
05	<b>Business models as a key concept of strategic management.</b>	8	L1,L2,L3,L4
	Variety of business model frameworks: Canvas, 'Zott-Amit' model, BM navigator, 4W approach, Hybrid business models. Resource-based view (RBV). Industrial organization.		
06	<b>Digital business models.</b>	8	L2,,L4,
	E-commerce. Innovative business model in retail and consumer goods. Omnichannel retail. Manufacturing business models. Digital manufacturing. Developers as new decision makers. Case-study of Apple, Android, Tinkoff.		
Total		46	

### Books and References:

Sr. No	Title of the book	Authors	Publisher	Edition	Year
1	Strategic management of technological Innovation	Melissa A. Schilling	McGraw-Hill	Fifth Edition	2017
2	Management of technology	Tarek M. Khalil	McGraw Hill	Second Edition	2009
3	Business model generation: a handbook for visionaries, game changers, and	Osterwalder, A., &Pigneur, Y.	John Wiley & Sons	ThirdEdition	2010

	challengers.				
4	Value creation in e-business.	Amit, R., & Zott, C.	Strategic management journal,	22(6-7), 493-520.	2001

**Online Reference**

SNo.	Website Name	URL	Modules Covered
1.	Ideaconnection.com	<a href="https://www.ideaconnection.com/innovation-videos/">https://www.ideaconnection.com/innovation-videos/</a>	M1,M2
2.	Ideaconnection.com	<a href="https://www.ideaconnection.com/innovation-videos/">https://www.ideaconnection.com/innovation-videos/</a>	M3,M4
3.	Ideaconnection.com	<a href="https://www.ideaconnection.com/innovation-videos/">https://www.ideaconnection.com/innovation-videos/</a>	M5,M6
4.	<a href="https://nptel.ac.in">https://nptel.ac.in</a>	<a href="https://nptel.ac.in/courses/110/107/110107094/">https://nptel.ac.in/courses/110/107/110107094/</a>	M1,M2,M3,M4,M5, M6
5.	Coursera.org	<a href="https://www.coursera.org/learn/digital-business-models/lecture/nJTB0/lesson-4-asymmetric-business-models-creating-unfair-advantage">https://www.coursera.org/learn/digital-business-models/lecture/nJTB0/lesson-4-asymmetric-business-models-creating-unfair-advantage</a>	M4,M5,M6
6.	online.stanford.edu	<a href="https://online.stanford.edu/courses/xine249-building-business-models">https://online.stanford.edu/courses/xine249-building-business-models</a>	M1,M2,M3,M4,M5, M6



**B.E. Semester –VIII**  
**Choice Based Credit Grading Scheme with Holistic Student Development (CBCGS-H 2019)**  
**Syllabus under Autonomy (w.e.f. A.Y. 2021-22)**

B.E. (Computer Engineering)					BE Open Elective SEM: VIII				
Course Name : Environment Management					Course Code: OEC- CS8014				
Contact Hours Per Week : 03					Credits : 03				
Teaching Scheme (Program Specific)					Examination Scheme (Formative/ Summative)				
Modes of Teaching / Learning / Weightage					Modes of Continuous Assessment / Evaluation				
Hours Per Week					Theory (100)		Practical/Oral (25)	Term Work (25)	Total
Theory	Tutorial	Practical	Contact Hours	Credits	IA	ESE	PR	TW	
3	-	-	3	3	25	75	—	—	100
<b>IA: Internal Assessment - Paper Duration – 1 Hour</b> <b>ESE: End Semester Examination - Paper Duration - 3 Hours</b> <b>The weightage of marks for continuous evaluation of Term work/Report: Formative (40%), Timely completion of practical (40%) and Attendance/Learning Attitude (20%)</b>									
<b>Prerequisite:</b> Fundamentals of Chemistry and biology									

**Course Objective:** The course intends to give an understanding of environmental issues relevant to India and global concerns, the concept of ecology and familiarize the learner with environment related legislations.

**Course Outcomes:** Upon completion of the course student will be able to

S. No	Course Outcomes	Cognitive levels of attainment as per Bloom's Taxonomy
1	Understand the concept of environmental management and the Energy scenario.	L1 L2
2	Understand ecosystem and interdependence, food chain etc.	L1 L2
3	Understand and interpret environment related legislations	L1 L2 L3 L4

**Detailed Syllabus:**

Module No.	Topics	Hrs.	Cognitive levels of Attainment as per Bloom's Taxonomy
1	<b>Introduction and Definition of Environment</b>	5	L1 L2
	Significance of Environment Management for contemporary managers, Career opportunities, Environmental issues relevant to India, Sustainable Development, the Energy scenario.		
2	<b>Global Environmental concerns</b>	6	L1 L2
	Global Warming, Acid Rain, Ozone Depletion, Hazardous Wastes, Endangered life-species, Loss of Biodiversity, Industrial/Man-made disasters, Atomic/Biomedical hazards, etc.		
3	<b>Concepts of Ecology</b>	7	L1 L2
	Ecosystems and interdependence between living organisms, habitats, limiting factors, carrying capacity, food chain, etc.		
4	<b>Scope of Environment Management</b>	7	L1 L2 L3 L4
	Role and functions of Government as a planning and regulating agency Environment Quality Management and Corporate Environmental Responsibility.		
5	<b>Total Quality Environmental Management</b>	7	L1 L2 L3 L4
	ISO-14000, EMS certification.		
6	<b>General overview of major legislations</b>	7	L1 L2 L3
	Environment Protection Act, Air (P & CP) Act, Water (P & CP) Act, Wildlife Protection Act, Forest Act, Factories Act, etc.		
	<b>Total</b>	<b>39</b>	

**Books and References:**

Sr. No.	Title	Author	Publisher	Edition	Year
1	Environmental Management: Principles and Practice	C J Barrow	Routledge Publishers	1st	1999
2	A Handbook of Environmental Management	John C. Lovett and David G. Ockwell	Edward Elgar Publishing	-----	2010
3	Environmental Management	V Ramachandra and Vijay Kulkarni	TERI Press	1st	2006
4	Indian Standard Environmental Management Systems — Requirements With Guidance For Use	Bureau Of Indian Standards	-----	-----	2005
5	Environmental Management: An Indian Perspective	S N Chary and Vinod Vyasulu	Macmillan India	-----	2000
6	Introduction to Environmental Management	Mary K Theodore and Louise Theodore	CRC Press	-----	2009
7	Environment and Ecology	Majid Hussain	Access Publishing	3rd	2015

**Online References:**

Sr. No.	Website Name	URL
1	Alison	<a href="https://alison.com/course/introduction-to-ecology">https://alison.com/course/introduction-to-ecology</a>
2	ISO	<a href="https://www.iso.org/iso-14001-environmental-management.html">https://www.iso.org/iso-14001-environmental-management.html</a>
3	<u>Certified Environment Law Analyst</u>	<a href="https://www.vskills.in/certification/legal/environment-law-certification">https://www.vskills.in/certification/legal/environment-law-certification</a>

**B.E. Semester –VIII**
**Choice Based Credit Grading Scheme with Holistic Student Development (CBCGS-H 2019)**
**Syllabus under Autonomy (w.e.f. A.Y. 2021-22)**

B.E. (Computer Engineering)							B.E. Open Elective SEM: VIII			
Course Name: Intellectual Property Rights and Patenting							Course Code: OEC- CS8015			
Teaching Scheme (Program Specific)					Examination scheme					
Modes of Teaching / Learning / Weightage					Modes of Continuous Assessment / Evaluation					
Hours Per Week					Theory (100)		Practical/Oral (25)	Term Work (25)	Total	
Theory	Tutorial	Practical	Contact Hours	Credits	IA	ESE	PR	TW	100	
3	-	-	3	3	25	75	-	-		
IA: Internal Assessment - Paper Duration – 1.5 Hours ESE: End Semester Examination - Paper Duration - 3Hours The weightage of marks for continuous evaluation of Term work/Report: Formative (40%), Timely completion of practical (40%) and Attendance (20%)										

**Course Objective:**

1. To understand intellectual property rights protection system
2. To promote the knowledge of Intellectual Property Laws of India as well as International treaty procedures
3. To get acquaintance with Patent search and patent filing procedure and applications

**Course Outcome**

SN	Course Outcomes	Cognitive Levels as per Blooms Taxonomy
1	understand Intellectual Property assets	L1,L2
2	assist individuals and organizations in capacity building	L1,L2,L3
3	work for development, promotion, protection, compliance, and enforcement of Intellectual Property and Patenting	L1,L2,L3

**Detailed Syllabus :**

Module No.	Topics	Hrs	Cognitive Levels as per Blooms Taxonomy
1	<b>Introduction to Intellectual Property Rights (IPR):</b>	5	L1,L2
	Meaning of IPR, Different category of IPR instruments - Patents, Trademarks, Copyrights, Industrial Designs, Plant variety protection, Geographical indications, Transfer of technology etc. <b>Importance of IPR in Modern Global Economic Environment:</b> Theories of IPR, Philosophical aspects of IPR laws, Need for IPR, IPR as an instrument of development		
2	<b>Enforcement of Intellectual Property Rights:</b>	7	
	Introduction, Magnitude of problem, Factors that create and sustain counterfeiting/piracy, International agreements, International organizations (e.g. WIPO, WTO) active in IPR enforcement <b>Indian Scenario of IPR:</b> Introduction, History of IPR in India, Overview of IP laws in India, Indian IPR, Administrative Machinery, Major international treaties signed by India, Procedure for submitting patent and Enforcement of IPR at national level etc.		L1,L2,L3
3	<b>Emerging Issues in IPR:</b>	5	L1,L2,L3
	Challenges for IP in digital economy, e-commerce, human genome, biodiversity and traditional knowledge etc.		
4	<b>Basics of Patents:</b>	7	L1,L2,L3
	Definition of Patents, Conditions of patentability, Patentable and non-patentable inventions, Types of patent applications (e.g. Patent of addition etc), Process Patent and Product Patent, Precautions while patenting, Patent specification Patent claims, Disclosures and non-disclosures, Patent rights and infringement, Method of getting a patent		
5	<b>Patent Rules:</b>	8	L1,L2
	Indian patent act, European scenario, US scenario, Australia scenario, Japan scenario, Chinese scenario, Multilateral treaties where India is a member (TRIPS agreement, Paris convention etc.)		
6	<b>Procedure for Filing a Patent (National and International):</b>	7	L1,L2,L3
	Legislation and Salient Features, Patent Search, Drafting and Filing Patent Applications, Processing of patent, Patent Litigation, Patent Publication etc, Time frame and cost, Patent Licensing, Patent Infringement <b>Patent databases:</b> Important websites, Searching international databases		

**Books and References:**

S. No.	Title	Authors	Publisher	Edition	Year
1	Patent system and related issues at a glance	Keayla B K	National Working Group	First	2004
2	The enforcement of Intellectual Property Rights	Lous Harns	Wipo	3rd	2018



**B.E. Semester –VIII**  
**Choice Based Credit Grading Scheme with Holistic Student Development (CBCGS-H 2019)**  
**Syllabus under Autonomy (w.e.f. A.Y. 2021-22)**

B.E.(Computer Engineering)							B.E. Open Elective SEM: VIII		
Course Name: Supply Change Management							Course Code: OEC-CS8016		
Teaching Scheme (Program Specific)					Examination Scheme (Formative/ Summative)				
Modes of Teaching / Learning / Weightage					Modes of Continuous Assessment / Evaluation				
Hours Per Week					Theory (100)		Practical/Oral (20)	Term Work (20)	Total
Theory	Tutorial	Practical	Contact Hours	Credits	IA	ESE	PR/ OR	TW	100
3	-	-	3	3	25	75	-	-	
IA: In-Semester Assessment- Paper Duration-1 Hours									
ESE : End Semester Examination - Paper Duration - 3 Hours									
The weightage of marks for continuous evaluation of Term work/Report: Formative (40%), Timely completion of practical (40%) and Attendance (20%)									
Prerequisite: NILL									

**Course Objective:**

1. To acquaint with key drivers of supply chain performance and their inter-relationships with strategy.
2. To impart analytical and problem-solving skills necessary to develop solutions for a variety of supply chain management & design problems.
3. To study the complexity of inter-firm and intra-firm coordination in implementing programs such as e-collaboration, quick response, jointly managed inventories, and strategic alliances.

**Course Outcome:**

SN	Course Outcomes	Cognitive Levels as per Bloom's Taxonomy
1	To acquaint with key drivers of supply chain performance and their inter-relationships with strategy.	L1,L2,L3
2	To impart analytical and problem-solving skills necessary to develop solutions for a variety of supply chain management & design problems.	L1,L3,L4
3	To study the complexity of inter-firm and intra-firm coordination in implementing programs such as e-collaboration, quick response, jointly managed inventories and strategic alliances.	L1,L2,L4

### Detailed Syllabus

Module	Detailed Contents	Hours	Cognitive Levels as per Bloom's Taxonomy
01	<b>Building a Strategic Framework to Analyze Supply Chains</b> Supply chain stages and decision phases, Process view of supply chain: Supply chain flows, Examples of supply chains, Competitive and supply chain strategies, Achieving strategic fit: Expanding strategic scope, Drivers of supply chain performance. Framework for structuring drivers: inventory, transportation facilities, information obstacles to achieving fit.	04	L1,L2,L3
02	<b>Designing the Supply Chain Network</b> Distribution Networking: Role, Design, Supply Chain Network(SCN):Role, Factors, Framework for design decisions.	05	L1,L3,L4
03	<b>Materials Management</b> Scope, Importance, Classification of materials, Procurement, Purchasing policies, Vendor development and evaluation. Inventory control systems of stock replenishment, Cost elements, EOQ and its derivative modules.	06	L1,L2,L3
04	<b>Dimensions of Logistics</b> Introduction: A Macro and Micro Dimensions, Logistics interfaces with other areas, Approach to analyzing logistics system, Logistics and systems analyzing: Techniques of logistics system analysis, factors affecting the cost and Importance of logistics.	06	L1,L3,L4
05	<b>Warehouse and Transport Management</b> Concept of strategic storage, Warehouse functionality, Warehouse operating principles, Developing warehouse resources, Material handling and packaging in warehouses, Transportation Management, Transport functionality and principles, Transport infrastructure, transport economics and Pricing. Transport decision making.	07	L1,L2,L3
06	<b>IT in Supply Chain</b> 6.1 IT framework, Customer Relationship Management (CRM), internal Supply chain management, Supplier Relationship Management (SRM) and Transaction Management. Coordination in a Supply Chain 6.2 Lack of supply chain coordination and the Bullwhip effect, Obstacle to Coordination, Managerial levers, Building partnerships and trust. Emerging Trends and Issues 6.3 Vendor managed inventory-3PL-4PL, Reverse logistics: Reasons, Role, Activities; RFID systems: Components, Applications, Implementation; Lean supply chain, Implementation of Six Sigma in supply chain, Green supply chain.	08	L1,L3,L4

**Books and References:**

SN	Title	Authors	Publisher	Edition	Year
1	Supply Chain Management Strategy, Planning, and operations	Sunil Chopra and Peter Meindl	Pearson	6th Edition	2016
2	Designing & Managing Supply chain	David Simchi Levi, Philip Kaminsky & Edith Smichi	McGraw Hill	3 <sup>rd</sup> Edition	2007
3	Supply Chain Redesign: Transforming Supply Chains into Integrated Value Systems,	Robert B Handfield, Ernest L Nicholas	Prentice Hall	--	2002
4	The Management of Business Logistics: A Supply Chain Perspective	Coyle, Bardi, Langley	Thomson learning	--	2003
5	Supply chain management: for global competitiveness	B S Sahay	Macmillan	--	1999

**Online Resources:**

S. No.	Website Name	URL	Modules covered
1.	<a href="https://nptel.ac.in">https://nptel.ac.in</a>	<a href="https://nptel.ac.in/courses/110/106/110106045/">https://nptel.ac.in/courses/110/106/110106045/</a>	2
2.	? <a href="https://nptel.ac.in">https://nptel.ac.in</a>	<a href="https://nptel.ac.in/courses/110/107/110107074/">https://nptel.ac.in/courses/110/107/110107074/</a>	3
3.	<a href="https://www.scmhub.com">https://www.scmhub.com</a>	<a href="https://www.scmhub.com/courses/BBA">https://www.scmhub.com/courses/BBA</a>	2
4.	<a href="https://www.udemy.com">https://www.udemy.com</a>	<a href="https://www.udemy.com/topic/supply-chain/">https://www.udemy.com/topic/supply-chain/</a>	4

**B.E. Semester –VIII**  
**Choice Based Credit Grading Scheme with Holistic Student Development (CBCGS-H**  
**2019) Syllabus under Autonomy (w.e.f. A.Y. 2021-22)**

B.E.(Computer Engineering)					B.E. SEM: VIII				
Course Name: Managerial Economics					Course Code: OEC-CS8021				
Contact Hours Per Week : 3					Credits : 3				
Teaching Scheme (Program Specific)					Examination Scheme (Formative/ Summative)				
Modes of Teaching / Learning / Weightage					Modes of Continuous Assessment / Evaluation				
Hours Per Week					Theory (100)		Practical/Oral (25)	Term Work (25)	Total
Theory	Tutorial	Practical	Contact Hours	Credits	IA	ESE			
3	-	-	3	3	25	75	-	-	100
<b>IA:</b> In Semester Assessment- Paper Duration – 1.5 Hrs <b>ESE :</b> End Semester Evaluation-									
<b>Prerequisite:</b> Financial Accounting <b>RBT :</b> Revised Bloom's Taxonomy									

**Course Objective:** By the end of the course, students will be able to understand both the theory and practice of Managerial Economics, the students will be in a position to appreciate the finer nuances of the subject, this subject will help the students in applying the knowledge so acquired in policy planning and managerial decision making.

**Course Outcomes:** Upon completion of the course students will be able to:

Sr. No.	Course Outcomes	RBT level
1	Analyze and apply the theory and practice of Managerial Economics	L1,L2,L3,L4
2	Understand the need to locate various factors affecting demand of products and plan marketing & business strategies accordingly. Also they will develop an understanding of the practical application of law of demand.	L1,L2,L3,L4
3	Understand the analytics of supply and demand and its various uses.	L1,L2,L3,L4,L5
4	Understand the holistic approach of production economy.	L1,L2,L3,L4,L5
5	Learn about the intricacies of the various market forms and their impact on the economy and business.	L1,L2,L3,L4,L5
6	Realize the importance of the different methods of capital budgeting as a tool of project management.	L1,L2,L3,L4,L5

**Detailed Syllabus:**

Module No.	Topics	Hrs.	RBT Levels
<b>1</b>	<b>Introduction to Managerial Economics</b>	5	L1,L2,L3,L4
	The meaning, scope and methods of Managerial Economics, Dominic Salvatore model of application of Economics to business decision making. Scarcity, choice & production possibility curve.		
<b>2</b>	<b>Consumer Behavior</b>	11	L1,L2,L3,L4
	Demand, types of demand, factors affecting demand & demand function. Making of linear demand function & linear demand curve. Law of demand. Consumer's surplus. Concept of elasticity of demand and its significance for a businessman. Types of Elasticity – Price Elasticity of Demand, Income Elasticity of Demand, Cross elasticity of demand & Promotional Elasticity of Demand, Demand forecasting – features, significance & methods.		
<b>3</b>	<b>Production Function</b>	5	L1,L2,L3,L4,L5
	Concept, Isoquant & Iso-cost analysis. Laws of returns to scale, economies & diseconomies of scale. Revenue Analysis, Cost analysis and break even analysis		
<b>4</b>	<b>Supply</b>	7	L1,L2,L3,L4,L5
	Concept of supply, factors affecting supply & the law of supply Determination of equilibrium price: effects of changes in demand & supply on equilibrium price.		
<b>5</b>	<b>Types of markets</b>	9	L1,L2,L3,L4,L5
	Perfect competition, monopoly, oligopoly & monopolistic competition – features and price determination. Pricing practices: Factors affecting pricing decision. Marginal cost pricing, mark up pricing, transfer pricing, product line pricing, price skimming and penetration price.		
<b>6</b>	<b>Profit Management</b>	8	L1,L2,L3,L4,L5
	• Profit management • Role of profits in a market economy • Nature and measurement of profit, profit policies • The hypothesis of profit maximization and its alternatives. Demand for capital • Supply of capital • Capital Rationing • Capital Budgeting, Net Present Value (NPV), Internal Rate of Return (IRR). • Appraising - the profitability of projects		
<b>Total Hours</b>		<b>45</b>	



### **Books and References:**

Sr. No	Title	Authors	Publisher	Edition	Year
1	Managerial Economics in a Global Economy	Dominick Salvatore	Oxford University Press	Seventh	2011
2	Managerial Economics	Suma Damodaran	Oxford University Press	Second	2010
3	Microeconomics for Business	Satya P Das	SAGE	First	2007
4	Economics	Paul Samuelson and Richard Nordhaus	MIT Press 1998.	FIRST	1998
5	Managerial Economics	Milton Spencer and Louis Siegelman	Palala Press	Second	2015
6	Managerial Economics: Concepts and Cases	Mote, Paul and Gupta	Princeton, 2010	First	2010

### **Online References:**

Sr. No.	Website Name	URL	Modules Covered
1	NPTEL.ac.in	<a href="https://nptel.ac.in/courses/110/101/110101005/">https://nptel.ac.in/courses/110/101/110101005/</a>	M1,M2,M3,M4,M5,M6
2	Udemy.com	<a href="https://www.udemy.com/course/introduction-to-managerial-economics/">https://www.udemy.com/course/introduction-to-managerial-economics/</a>	M1,M2,M3,M4,M5,M6
3	Swayam.ac.in	<a href="https://onlinecourses.swayam2.ac.in/imb19_mg16/preview">https://onlinecourses.swayam2.ac.in/imb19_mg16/preview</a>	M1,M2,M3,M4,M5,M6
4	Harvard.edu	<a href="https://online-learning.harvard.edu/course/managerial-economics?delta=0">https://online-learning.harvard.edu/course/managerial-economics?delta=0</a>	M1,M2,M3,M4,M5,M6
5	Courseera.org	<a href="https://www.coursera.org/courses?query=managerial%20economics">https://www.coursera.org/courses?query=managerial%20economics</a>	M1,M2,M3,M4,M5,M6

**B.E. Semester –VIII**  
**Choice Based Credit Grading Scheme with Holistic Student Development (CBCGS-H**  
**2019) Syllabus under Autonomy (w.e.f. A.Y. 2021-22)**

B.E.(Computer Engineering )							B.E. SEM: VIII			
Course Name: Digital Business Management							Course Code: OEC-CS8022			
Teaching Scheme (Program Specific)					Examination scheme					
Modes of Teaching / Learning / Weightage					Modes of Continuous Assessment / Evaluation					
Hours Per Week					Theory (100)		Practical/Oral (25)	Term Work (25)	Total	
Theory	Tutorial	Practical	Contact Hours	Credits	IA	ESE	PR	TW	100	
3	-	-	3	3	25	75	-	-		
IA: Internal Assessment - Paper Duration – 1.5 Hours										
ESE: End Semester Examination - Paper Duration - 3 Hours										

**Course Objective:**

1. To understand intellectual property rights protection system
2. To promote the knowledge of Intellectual Property Laws of India as well as International treaty procedures
3. To get acquaintance with Patent search and patent filing procedure and applications

**Course Outcome**

SN	Course Outcomes	Cognitive Levels as per Blooms Taxonomy	
1	understand Human Resource Management	L1,L2	
2	assist Organization of Personnel Functions	L1,L2,L3	
3	work for Manpower Planning	L1,L2,L3	
4	work for Motivating Employees	L1,L2,L3	
5	work for Performance Appraisal Systems and Training	L1,L2,L3	
6	work for Development Organisation Development	L1,L2,L3	
	<b>Detailed Syllabus :</b>		
Module No.	Topics	Hrs	Cognitive Levels as per Blooms Taxonomy
1	<b>Introduction to Digital Business-</b> 1.1 Introduction, Background and current status, E-market places, structures, mechanisms, economics and impacts Difference between physical economy and digital economy,. 1.2 <b>Drivers of digital business-</b> Big Data & Analytics, Mobile, Cloud Computing, Social media, BYOD, and Internet of Things(digitally intelligent machines/services) 1.3 opportunities and Challenges in Digital Business,	6	L1,L2
2	<b>Overview of E-Commerce</b> <b>2.1 Overview of E-Commerce</b> E-Commerce- Meaning, Retailing in e-commerce-products and services, consumer behavior, market research and advertisement <b>B2B-E-commerce-</b> selling and buying in private e-markets, public B2B exchanges and support services, e-supply chains, Collaborative Commerce, Intra business ECand Corporate portals	7	L1,L2,L3

	<b>2.2 Other E-C models and applications</b> , innovative EC System-From E-government and learning to C2C, mobile commerce and pervasive computing EC Strategy and Implementation-EC strategy and global EC, Economics and Justification of EC, <b>2.3 Using Affiliate marketing to promote your e-commerce business</b> , Launching a successful online business and EC project, Legal, Ethics and Societal impacts of EC		
3	<b>Digital Business Support services</b> <b>3.1 Digital Business Support services:</b> ERP as e –business backbone, knowledgeTope Apps, Information and referral system <b>3.2 Application Development:</b> Building Digital business Applications and Infrastructure	5	L1,L2,L3
4	<b>Managing E-Business</b> 4.1 Managing E-Business-Managing Knowledge, Management skills for e-business, 4.2 Managing Risks in e –business Security Threats to e-business -Security Overview, Electronic Commerce Threats, Encryption, Cryptography, Public Key and Private Key Cryptography, Digital Signatures, Digital Certificates, Security Protocols over Public Networks: HTTP, SSL, Firewall as Security Control, Public Key Infrastructure (PKI) for Security, Prominent Cryptographic Applications	8	L1,L2,L3
5	<b>E-Business Strategy-</b> 5.1 E-Business Strategy-E-business Strategic formulation- Analysis of Company's Internal and external environment, Selection of strategy. 5.2 E-business strategy into Action, challenges and E-Transition (Process of Digital Transformation)	6	L1,L2,L3
6	<b>Materializing e-business</b> 6.1 Materializing e-business: From Idea to Realization-Business plan preparation 6.2 Case Studies and presentations	7	L1,L2,L3

#### Books and References:

S. No.	Title	Authors	Publisher	Edition	Year
1	A textbook on E-commerce	Er Arunrajan Mishra, Dr W K Sarwade	Neha Publishers & Distributors		2011
2	E-commerce from vision to fulfilment	Elias M. Awad,	PHI-Restricted,		2002
3	Digital Business and E-Commerce Management	Ed, Dave Chaffey,	Pearson,		August 2014
4	Introduction to E-business-Management and Strategy,	Colin Combe,	ELSVIER		2006
5	Digital Business Concepts and Strategy,	Eloise Coupey	Pearson	2 <sup>nd</sup> Edition,	2009
6	Trend and Challenges in Digital Business Innovation,	Vinocenzo Morabito,	Springer		
7	Digital Business	Discourse Erika Darics	Palgrave Macmillan		April 2015
8	E-Governance-Challenges and Opportunities in	Proceedings in 2 <sup>nd</sup> International Conference theory and practice of Electronic Governance	Oxford Publications		

9	Perspectives the Digital Enterprise –	A framework for Transformation, TCS consulting journal Vol.5			
10	Measuring Digital Economy-	A new perspective -	DOI:10.1787/9789264221796-enOECD Publishing		

**B.E. Semester –VIII**
**Choice Based Credit Grading Scheme with Holistic Student Development (CBCGS-H 2019)**
**Syllabus under Autonomy (w.e.f. A.Y. 2021-22)**

B.E. (Computer Engineering)							B.E. SEM: VIII			
Course Name: Social Network Analysis							Course Code: OEC-CS8023			
Teaching Scheme (Program Specific)					Examination Scheme (Formative/ Summative)					
Modes of Teaching / Learning / Weightage					Modes of Continuous Assessment / Evaluation					
Hours Per Week					Theory (100)		Practical/Oral (25)	Term Work (25)	Total	
Theory	Tutorial	Practical	Contact Hours	Credits	IA	ESE	PR/OR	TW	100	
3	-	-	3	3	25	75	-	-		
IA: In-Semester Assessment - Paper Duration – 1.5 Hours ESE: End Semester Examination - Paper Duration - 3 Hours The weightage of marks for continuous evaluation of Term work/Report: Formative (40%), Timely completion of practical (40%) and Attendance / Learning Attitude (20%)										
Prerequisite: algorithmic ,programming										

**Course Objective:** The Objective of this course is to deliver the fundamental concepts of theory of computation describing formal mathematical models of computation such as FA,PDA,LBA and TM by comparing their power, limitations, languages and their applications in computation and complexity theory and also to learn that not all problems are solvable by computers.

**Course Outcomes:** Upon completion of the course students will be able to:

Sr. No.	Course Outcomes	Cognitive levels of attainment as per Bloom's Taxonomy
1	understand the basic concepts of social networks	L1, L2, L3
2	understand the fundamental concepts in social network mining	L1, L2, L3
3	understand the modelling and visualization of network	L1, L2, L3
4	understand the concepts of <b>social network graph analysis</b>	L1, L2, L3,L4
5	Perform visualization and exploration using Gephi software.	L1, L2, L3,L4
6	understand the <b>dynamic social networks</b>	L1,L2



### Detailed Syllabus:

Module No.	Introduction	Hrs.	Cognitive levels of attainment as per Bloom's Taxonomy
1	<b>Introduction</b>	9	L1, L2, L3
	Introduction to Semantic Web, the Social Web - Social Network analysis, Development of Social Network Analysis – the concepts and measures in network analysis, Blogs and online communities - Web-based networks - Applications of Social Network Analysis. Advantages and disadvantages in social networks.		
2	<b>Social Network Mining</b>	7	L1,L2, L3
	Introduction to social network mining. Social network extraction from big data, Various social network mining tasks with real-world examples. Community detection and Shingling algorithm, Social Networks as Graphs. Random graph models, ranking algorithms, Graph and Matrices, Basic measures for individuals and networks,		
3	<b>Modelling and visualization of network</b>	7	L1,L2, L3
	Mechanisms : Homophily, Opportunity, and Balance, edges, nodes Analyze a social network by data wrangling and visualizing a network.		
4	<b>Social Network Graph Analysis</b>	7	L1, L2,L3,L4
	Graph kernels, Graph classification, mining and outlier detection, centrality measures, network level measures, partitioning of graphs, components and bridges, cliques		
5	<b>Gephi</b>	9	L1, L2, L3,L4
	Download and Install Gephi, load network data, manipulate the color, structures and shapes, get Network-Level Measures, centrality measures,		
6	<b>Dynamic Social Networks</b>	6	L1, L2
	Social learning on networks, Information and Biological networks, Various applications of Social Network mining in real world applications, Social Connects: Affiliation and identity		
	<b>Total Hours</b>	<b>45</b>	

### Books and References:

SN	Title	Authors	Publisher	Edition	Year
1	Social Network Data Analytics	Charu C. Aggarwal	Springer	1 <sup>st</sup>	2011
2	Network Graph Analysis and Visualization with Gephi	Ken Cherven	Packt	1 <sup>st</sup>	2013
3	Social network analysis: A handbook	Scott, J.	Sage	2 <sup>nd</sup>	2007
4	Social Network Analysis,	Knoke	Sage	2 <sup>nd</sup>	2008

**Online References:**

S. No.	Website Name	URL	Modules Covered
1	towardsdatascience.com	<a href="https://towardsdatascience.com/how-to-get-started-with-social-network-analysis-6d527685d374">https://towardsdatascience.com/how-to-get-started-with-social-network-analysis-6d527685d374</a>	M6
2	iopscience.iop.org	<a href="https://iopscience.iop.org/article/10.1088/1742-6596/1235/1/012111/pdf">https://iopscience.iop.org/article/10.1088/1742-6596/1235/1/012111/pdf</a>	M1-M5

**B.E. Semester –VIII**  
**Choice Based Credit Grading Scheme with Holistic Student Development (CBCGS-H 2019)**  
**Syllabus under Autonomy (w.e.f. A.Y. 2021-22)**

B. E. (Computer Engineering)							B.E. (SEM : VIII)			
Course Name : Basic Taxation for Engineers							Course Code : OEC-CS8024			
Teaching Scheme (Program Specific)					Examination Scheme (Formative/ Summative)					
Modes of Teaching / Learning / Weightage					Modes of Continuous Assessment / Evaluation					
Hours Per Week					Theory		Practical/Oral /Present ation	Term Work	Total	
Theory	Tutorial	Practical	Contact Hours	Credits	IA	ESE	PR	TW	100	
3	-	-	3	3	25	75	--	--		
IA: In-Semester Assessment - Paper Duration – 1.5 Hours										
ESE: End Semester Examination - Paper Duration - 3 Hours										
The weightage of marks for continuous evaluation of Term work/Report: Formative (40%), Timely completion of practical (40%) and Attendance / Learning Attitude (20%)										
Prerequisite:										

**Course Objective:** This course discusses taxation, its principles, its objectives, and its effects; the nature and purposes of taxation, whether taxes should be classified as direct or indirect. It also instils an awareness instudents that taxes constitute significant costs to businesses and households and therefore have a major impactin economic and other decision-making, also these costs are potentially controllable through legitimate tax minimisation strategies. The course also shall enable students to appreciate the wider economic, social, administrative-compliance and political contexts within which taxes are imposed.

**Course Outcomes: Upon completion of the course students will be able to:**

SN	Course Outcomes	Cognitive levels of attainment as per Bloom's Taxonomy
1	Understand the basic principles of taxation in India and the various provisions of Income Tax Act 1961	L2
2	Understand and apply the computation of taxable income under the heads capital gain and other sources	L3
3	Apply the provisions of clubbing of income, set off of losses and deductions permitted under the Income Tax Act, 1961.	L3
4	Analyze the computation of taxable income under the head Salaries, Income from House Property and Profits and Gains of Business or Profession	L4
5	Differentiate between Direct and Indirect Tax	L4
6	Understand the Concept of Service Tax and laws	L2

**Detailed Syllabus:**

Module No	Topics	Hrs	Cognitive levels of attainment as per Bloom's Taxonomy
1	<b>Principles of Taxes</b>	08	L1, L2
	Objectives of Taxation, Principles related to taxation system, Characteristics of good tax system, Effects of Taxation on Production, Distribution and Employment, Taxable capacity – Absolute and Relative Capacity, Factors determining Taxable Capacity, The Income tax Act, 1922, Present system of taxation in India - Income Tax Act 1961		
2	<b>Introduction to Income tax</b>	07	L1, L2, L3
	Basis of Charge, Rates of Tax, Residential Status of Individual, HUF, Firm, Company, AOP/BOI, Local Authority, Practical problems on determination of residential status and incidence of tax, Scope of total income		
3	<b>Incomes Exempt from Tax</b>	07	L1, L2, L3
	Different categories of Exempted Income, Incomes which are neither included in Total Income nor Income Tax is payable, Incomes which are included in Total Income, but no income Tax is payable.		
4	<b>Income from Salaries</b>	08	L1, L2, L3, L4
	Basis of Charge, Different Forms of Salary, Treatment of provident fund, Allowances, Perquisites, treatment of other items included in salary, Profit-in-lieu of Salary Gratuity, Pension and Commuted pension, Encashment of earned leave, Retrenchment compensation, Provident Fund – Types of provident fund and tax treatment, Deductions, Computation of Income from Salary.		
5	<b>Direct and Indirect Taxes</b>	08	L1, L2, L3, L4
	Classification of Taxes, Meaning of direct tax, Basic Concepts: Assessee, Assessment Year, Previous Year, Person, Income, Gross Total Income, Total Income. Meaning of Indirect Taxes, Features, Advantages, Disadvantages, Distinction between Direct and Indirect Taxes, Central Indirect Tax Laws, Indirect Tax Laws of the States, convergence of indirect taxes, Movement to GST		
6	<b>Service Tax</b>	07	L1, L2
	Service Tax Law in India, the concept of 'Negative List', Categorization of Taxable and Tax-free Services, Exemptions and Rebates from Service Tax, Provisions for Rectification of Mistakes and schemes of Assessment		
<b>Total Hours</b>		<b>45</b>	

**Books and References:**

Sr. No	Title	Authors	Publisher	Edition	Year
1	Income Tax	Vinod K. Sinhanian & Monica Sinhanian	Taxmann Publications Pvt. Ltd	64 <sup>th</sup>	2020-21
2	Taxation Law & Practice	Mehtrotra & Goyal	Sahitya Bhavan Publication	61 <sup>st</sup>	2020
3	Direct Taxes	Lal B.B	Konark Publishing House	30 <sup>th</sup>	2012
4	Indirect Taxes	Datey, V.S	Taxmann Publications Pvt. Ltd	44 <sup>th</sup>	2020
5	Systematic Approach to Income Tax	Girish Ahuja & Ravi Gupta	Bharat Law House Pvt. Ltd	33 <sup>rd</sup>	2014-15
6	Indirect Taxation	Balachandran. V	Sultan Chand & Sons	18 <sup>th</sup>	2019



**B.E. Semester –VIII**  
**Choice Based Credit Grading Scheme with Holistic Student Development (CBCGS-H 2019)**  
**Syllabus under Autonomy (w.e.f. A.Y. 2021-22)**

B.E. (Computer Engineering)							B.E. SEM: VIII			
Course Name: Product Design and Development							Course Code: OEC-CS8025			
Teaching Scheme (Program Specific)					Examination Scheme (Formative/ Summative)					
Modes of Teaching / Learning / Weightage					Modes of Continuous Assessment / Evaluation					
Hours Per Week					Theory (100)		Practical/Oral (25)	Term Work (25)	Total	
Theory	Tutorial	Practical	Contact Hours	Credits	IA	ESE	PR	TW	100	
3	-	-	-	3	25	75	-	-		
IA: In-Semester Assessment - Paper Duration – 1.5 Hours										
ESE : End Semester Examination - Paper Duration - 3 Hours										
The weightage of marks for continuous evaluation of Term work/Report: Formative (40%), Timely completion of practical (40%) and Attendance (20%)										
Prerequisite: None										

**Course Objectives:**

Course intended to deliver the fundamental knowledge of basic principles involved in design of new product and its development.

**Course Outcomes:**

SN	Course Outcomes	Cognitive levels as per bloom's Taxonomy
1	Identify design and development process of industrial products, considering ergonomic requirements.	L1, L2
2	Explain market requirements and manufacturing aspects of industrial design.	L1, L2, L3
3	Identify consumer products, functions and use.	L1, L2, L3
4	Explain aesthetic concept, symmetry.	L1, L2, L3, L4
5	Explain economic considerations, value analysis and cost reduction.	L1, L2
6	Employ standard organization structure, standardization, record keeping.	L1, L2, L4, L5, L6

### Detailed Syllabus

Module No.	Topics	Hrs.	Cognitive levels as per bloom's Taxonomy
1	<b>Introduction-Approach to Industrial Design</b>	4	L1, L2
	Approach to industrial product based on idea generation and innovations to meet the needs of the developing society. Design and development process of industrial products, various steps such as creative process involved in idea marketing, designers, mind- criticism, design process, creation. Ergonomics and aesthetic requirements of product design, quality and maintainability consideration in product design, Use of modeling technique, prototype designs, conceptual design.		
2	<b>Industrial Product Design</b>	8	L1, L2, L3
	General design situations, setting specifications, requirements and ratings, their importance in the design, Study of market requirements and manufacturing aspects of industrial designs. Aspects of ergonomic design of machine tools, testing equipment, instruments, automobiles, process equipment etc. Convention of style, form and color of industrial design.		
3	<b>Design of Consumer Product</b>	8	L1, L2, L3, L4
	Functions and use, standard and legal requirements, body dimensions. Ergonomic considerations, interpretation of information, conversions for style, forms, colors.		
4	<b>Aesthetic Concepts</b>	8	L1, L2, L3
	Concept of unity order with variety, concept of purpose, style and environment, Aesthetic expression of symmetry, balance, contrast and continuity, proportion, rhythm, radiation. Form and style of product: visual effect of line and form, mechanics of seeing, psychology of seeing, influence of line and form, Components of style, Basic factors, effect of color on product appearance, color composition, conversion of colors of engineering products.		
5	<b>Economic Considerations</b>	10	L1, L2, L3, L4
	Selection of material, Design for production, use of standardization, value analysis and cost reduction, maintenance aspects in design.		
6	<b>Design Organization</b>	7	L1, L2, L4, L5, L6
	Organization Structure, Designer position, Drawing office procedure, Standardization, record keeping, legal procedure of Design patents.		

**Books and References:**

SN	Title	Authors	Publisher	Edition	Year
1	Industrial Design for Engineers	W. H. Mayall	London Hiffee books Ltd	-	1967
2	Problems of Product Design and Development	Hearn Buck	Pergamon Press	-	-
3	Industrial Designs in Engineering	Charles H. Fluerichem	-	-	-
4	Material of Invention: Materials and Design	Ezio Manzini	The MIT Press	-	1989
5	The Science of Engineering Design	Percy H. Hill	Holt, Rinehart and Winston Publication	-	1970

**Online References:**

Sr.No.	Website Name	URL	Modules Covered
1	<a href="https://nptel.ac.in">https://nptel.ac.in</a>	<a href="https://nptel.ac.in/courses">https://nptel.ac.in/courses</a>	M1-M6

**B.E. Semester –VIII**
**Choice Based Credit Grading Scheme with Holistic Student Development (CBCGS-H 2019)**
**Syllabus under Autonomy (w.e.f. A.Y. 2021-22)**

BE (Computer Engineering)							SEM: VIII				
Course Name: Development Engineering							Course Code: OEC-CS8026				
Contact Hours Per Week: 03							Credits: 03				
Teaching Scheme (Program Specific)					Examination Scheme (Formative / Summative)						
Modes of Teaching / Learning / Weightage					Modes of Continuous Assessment / Evaluation						
Hours Per Week					Theory (100)		Practical / Oral (25)		Term Work (25)		Total
Theory	Tutorial	Practical	Contact Hours	Credits	IA	ESE	PR		PR		100
03	-	-	03	03	25	75	-	-	-	-	
IA: In semester Assessment –Paper Duration – 1.5 Hours											
ESE: End Semester Examination – Paper Duration – 3Hours											
The weightage of marks for continuous evaluation taken with Term work/Report: Formative (40%), Timely completion of practical (40%) and Attendance (20%)											
Prerequisite: QSEV, TENDER & CONTRCT											

**Course Objectives:**

SN	Course Objectives	RBT Level
1	To familiarize the characteristics of rural Society and the Scope, Nature and Constraints of rural Development	L1, L2, L3, L4
2	To provide an exposure to implications of 73 <sup>rd</sup> CAA on Planning, Development and Governance of Rural Areas	L1, L2, L3, L4
3	An exploration of human values, which go into making a ‘good’ human being, a ‘good’ professional, a ‘good’ society and a ‘good life’ in the context of work life and the personal life of modern Indian professionals	L1, L2, L3, L4
4	To familiarize the Nature and Type of Human Values relevant to Planning Institutions	L1, L2, L3, L4

**Course Outcomes:**

SN	Course Outcomes	RBT Level
1	Demonstrate understanding of knowledge for Rural Development.	L1, L2, L3, L4
2	Prepare solutions for Management Issues.	L1, L2, L3, L4
3	Take up Initiatives and design Strategies to complete the task	L1, L2, L3, L4
4	Develop acumen for higher education and research.	L1, L2, L3, L4
5	Demonstrate the art of working in group of different nature	L1, L2, L3, L4
6	Develop confidence to take up rural project activities independently	L1, L2, L3, L4

## Detailed Syllabus:

Module No.	Topics	Hrs.	RBT Levels
1	Introduction to Rural Development Meaning, nature and scope of development; Nature of rural society in India; Hierarchy of settlements; Social, economic and ecological constraints for rural development. Roots of Rural Development in India Rural reconstruction and Sarvodaya programme before independence; Impact of voluntary effort and Sarvodaya Movement on rural development; Constitutional direction, directive principles; Panchayati Raj - beginning of planning and community development; National extension services.	06	L1, L2, L3, L4
2	Post-Independence rural Development Balwant Rai Mehta Committee - three tier system of rural local Government; Need and scope for people's participation and Panchayati Raj; Ashok Mehta Committee - linkage between Panchayati Raj, participation and rural development.	09	L1, L2, L3, L4
3	Rural Development Initiatives in Five Year Plans Five Year Plans and Rural Development; Planning process at National, State, Regional and District levels; Planning, development, implementing and monitoring organizations and agencies; Urban and rural interface - integrated approach and local plans; Development initiatives and their convergence; Special component plan and sub-plan for the weaker section; Micro-eco zones; Data base for local planning; Need for decentralized planning; Sustainable rural development	12	L1, L2, L3, L4
4	Post 73rd Amendment Scenario 73rd Constitution Amendment Act, including - XI schedule, devolution of powers, functions and finance; Panchayati Raj institutions - organizational linkages; Recent changes in rural local planning; Gram Sabha - revitalized Panchayati Raj; Institutionalization; resource mapping, resource mobilization including social mobilization; Information Technology and rural planning; Need for further amendments.	06	L1, L2, L3, L4
5	Values and Science and Technology Material development and its values; the challenge of science and technology; Values in planning profession, research and education Types of Values Psychological values — integrated personality; mental health; Societal values — the modern search for a good society; justice, democracy, rule of law, values in the Indian constitution; Aesthetic values — perception and enjoyment of beauty; Moral and ethical values; nature of moral judgment; Spiritual values; different concepts; secular spirituality; Relative and absolute values; Human values— humanism and human values; human rights; human values as freedom, creativity, love and wisdom	07	L1, L2, L3, L4
6	Ethics Canons of ethics; ethics of virtue; ethics of duty; ethics of responsibility; Work ethics; Professional ethics; Ethics in planning profession, research and education	05	L1, L2, L3, L4
<b>TOTAL</b>		<b>45</b>	



**Books and References:**

SN	Title	Authors	Publisher	Edition	Year
1	ITPI, Village Planning and Rural Development,	ITPI,	New Delhi	-	-
2	Thooyavan, K.R. Human Settlements:	A 2005 MA Publication, Chennai	A 2005 MA Publication, Chennai	-	-
3	GoI, Constitution (73rdGoI, New Delhi Amendment) Act,	GoI, New Delhi	GoI, New Delhi	-	-
4	Planning Commission, Five Year Plans, Planning Commission	Planning Commission, Five Year Plans, Planning Commission	Planning Commission	-	-
5	Planning Commission, Manual of Integrated District Planning, 2006,	Planning Commission New Delhi	Planning Commission New Delhi	-	-
6	Planning Guide to Beginners	Planning Guide to Beginners	Planning Guide to Beginners	-	-
7	The Urban Complex, Doubleday	Weaver, R.C.,	-	-	-
8	Ethics in Planning, American Planning Association,	Farmer, W.P. et al	Washington		
9	Normative Ethics in Planning, Journal of Planning Literature	How, E.,	Vol.5, No.2, pp. 123-150	-	-
10	Implications for Planning Theory and Ethics, Planning Theory and Practice,	Watson, V. Conflicting Rationalities:	Vol. 4, No.4, pp.395 – 407	-	-

**B.E. Semester –VIII**
**Choice Based Credit Grading Scheme with Holistic Student Development (CBCGS-H 2019)**
**Syllabus under Autonomy (w.e.f. A.Y. 2021-22)**

BE Computer Engineering							B.E. SEM : VIII		
Course Name: Project-II							Course Code : PROJ-CS801		
Teaching Scheme (Program Specific)					Examination Scheme (Formative/ Summative)				
Modes of Teaching / Learning / Weightage					Modes of Continuous Assessment / Evaluation				
Hours Per Week					Theory (100)		Practical/Oral (25)	Term Work (25)	Total
Theory	Tutorial	Practical	Contact Hours	Credits	IA	ESE	PR/OR	TW	150
-	-	12	12	6	-	-	100	50	
Prerequisite: Computer Programming language/s, Software Engineering									

**Course Objectives:**

The primary objective is to meet the milestones formed in the overall project plan decided in Project - I. The idea presented in Project-I should be implemented in Project -II with results, conclusion and future work. The project will culminate in the production of a thesis by each individual student.

**Guidelines:**

**Project Report Format:** At the end of semester a student need to prepare a project report should be prepared as per the guidelines issued by the University of Mumbai. Along with project report a CD containing: project documentation, Implementation code, required utilities, Software's and user Manuals need to be attached.

**Term Work:** Student has to submit weekly progress report to the internal guide and whereas internal guide has to keep track on the progress of the project and also has to maintain attendance report. This progress report can be used for awarding term work marks. In case of industry projects, visit by internal guide will be preferred to get the status of project.

Distribution of marks for term work shall be as follows:

- Weekly Attendance on Project Day
- Project work contributions as per objective
- Project Report (Hard Bound)
- Term End Presentation (Internal)
- The final certification and acceptance of TW ensures the satisfactory performance on the above aspects.

**B.E. Semester –VIII**
**Choice Based Credit Grading Scheme with Holistic Student Development (CBCGS-H 2019)**
**Syllabus under Autonomy (w.e.f. A.Y. 2021-22)**

BE Computer Engineering					SEM: VIII			
Course Name: Summer Internship					Course Code: SI-CS801			
Teaching Scheme (Program Specific)					Examination Scheme (Formative/ Summative)			
Modes of Teaching / Learning / Weightage					Modes of Continuous Assessment / Evaluation			
Total Hours : Maximum 2 Weeks ( 60 to 80 Hours during summer vacation)						PR	TW	Total
Theory	Tutorial	Practical	Contact Hours	Credits	-	-	50	50
-	-	-	120*	3				
<b>Note :</b> 3. Internship will be done in institute laboratory in collaboration with industries. 4. Evaluation and assessment will be done as per AICTE guidelines.								
<b>Prerequisite:</b> Fundamental knowledge of respective Programmes								

**Course Objectives:**

To get industry like exposure in the institute laboratories by carrying out activities / projects. Also design innovative techniques / methods to develop the products.

**Course Outcomes: Upon completion of the course students will be able to:**

Sr. No.	Course Outcomes	Cognitive levels of attainment as per Bloom's Taxonomy
1	Apply subjects knowledge in the college laboratories for carrying out projects	L3, L4,L5
2	Developed innovative techniques / methods to develop the products	L3, L4,L5
3	Contribute for the society	L3, L4,L5

**Detailed Syllabus:**

Module No.	Topics	Cognitive levels of attainment as per Bloom's Taxonomy
1	<b>Program Specific Internship</b>	L3, L4,L5
	<ul style="list-style-type: none"> <li>Training and certification on emerging technologies in domains offered by Department of Computer Engineering</li> <li>Applying classroom and laboratory knowledge to design , develop and deploy the products</li> </ul>	
2	<b>Inter disciplinary Internship</b>	L3, L4,L5
	<ul style="list-style-type: none"> <li>To explore and understand issues and challenges in the other disciplines (EXTC, ELEX, MECH and CIVIL)</li> <li>Design , develop and deploy cost effective products using multidisciplinary approach</li> </ul>	
3	<b>Industry Specific Internship</b>	L3, L4,L5
	<ul style="list-style-type: none"> <li>To explore and understand issues and challenges in industry</li> <li>Developing solutions for industry specific problems</li> <li>Design , develop and deploy products for startup and SMEs</li> </ul>	
4	<b>Interpersonal Internship</b>	L3, L4,L5
	<ul style="list-style-type: none"> <li>To develop interpersonal skills such as leadership, marketing ,publicity and corporate ethics and communication</li> <li>To get competence in problem solving , presentation , negotiation skills</li> </ul>	
5	<b>Social Internship</b>	L3, L4,L5
	<ul style="list-style-type: none"> <li>Identify and study different real life issues in the society</li> <li>Identify societal problems and provide engineering solutions to solve these problems</li> </ul>	
6	<b>Academic Internship</b>	L3, L4,L5
	<ul style="list-style-type: none"> <li>Study report preparation, preparation of presentations, copy table book preparation , business proposal and IPR</li> <li>Capture aspirations &amp; expectations through interviews of students.</li> <li>Ways to connect research in technical institutes with industry.</li> <li>Taking inputs from self, local stakeholders and global stake holders which will help to develop process with comparative and competitive study.</li> </ul>	

**Books and References:**

Sr. No.	Title	Authors	Publisher	Edition	Year
1	The Ultimate Guide to Internships: 100 Steps to Get a Great Internship and Thrive in It (Ultimate Guides)	Eric Woodard	Allworth	I	2015

**Online References:**

Sr. No.	Website Name	URL	Modules Covered
1	<a href="https://www.letsintern.com/">https://www.letsintern.com/</a>	<a href="https://www.letsintern.com/internships/summer-internships">https://www.letsintern.com/internships/summer-internships</a>	M1-M6
1	<a href="https://codegnan.com">https://codegnan.com</a>	<a href="https://codegnan.com/blog/benefits-of-internships-and-importance">https://codegnan.com/blog/benefits-of-internships-and-importance</a>	M1-M6
2	<a href="https://www.honorsociety.org">https://www.honorsociety.org</a>	<a href="https://www.honorsociety.org/articles?category=internships">https://www.honorsociety.org/articles?category=internships</a>	M1-M6



**B.E. Semester –VIII**
**Choice Based Credit Grading Scheme with Holistic Student Development (CBCGS-H 2019)**
**Syllabus under Autonomy (w.e.f. A.Y. 2021-22)**

B.E.( Computer Engineering)					B.E.(SEM : VIII)		
Course Name : Cloud Computing					Course Code : HSD-CSPS801		
Teaching Scheme (Program Specific)					Examination Scheme (Formative/ Summative)		
Modes of Teaching / Learning / Weightage					Modes of Continuous Assessment / Evaluation		
Hours Per Week					Presentation	Report	Term Work
Theory	Tutorial	Practical	Contact Hours	Credits	AC	AC	TW
15	-	30	45	2	50	25	75
Audit course evaluated by Teacher Guardian							
Mid Semester Assessment for Term work will be on continuous basis							
<b>Prerequisite:</b> Subject knowledge, Domain knowledge							

**Course Objective:** The course intends to introduce basics of cloud computing, virtualization technology and major concepts related to the computing environment.

**Course Outcomes:** Upon completion of the course students will be able to:

SN	Course Outcomes	Cognitive levels of attainment as per Bloom's Taxonomy
1	Define Cloud Computing and memorize the different Cloud service and deployment models	L1, L2
2	Describe importance of virtualization along with their technologies.	L1, L2
3	Use and Examine different cloud computing services	L1, L2, L3
4	Analyze the components of open stack & Google Cloud platform and understand Mobile Cloud Computing	L1, L2, L3, L4
5	Describe the key components of Amazon Web Service	L1, L2, L3, L4, L5
6	Design & develop backup strategies for cloud data based on features.	L1, L2, L3, L4

**Detailed Syllabus:**

Module No.	Topics	Hrs.	Cognitive levels of attainment as per Bloom's Taxonomy
1	<b>Introduction</b>	3	L1, L2
	Defining Cloud Computing, Components of Cloud Computing, Cloud types: NIST and Cloud Cube Models, Cloud Deployment Models and Service Models, Cloud computing architecture, Advantages and Disadvantages of Cloud Computing		
2	<b>Virtualization</b>	2	L1, L2
	Virtualization: Characteristics of virtualized environment, Understanding the importance of Hypervisors, Type I & Type II Hypervisors, Taxonomy of virtualization,		
3	<b>Cloud Computing Services</b>	3	L1, L2, L3
	Exploring Cloud Computing Services: SPI Model: Software as a service, Platform as a service, and Infrastructure as a service. Anything as a service or Everything as a service (XaaS): Security as a Service, Identity management as a Service, Database as a Service, Storage as a Service, Collaboration as a Service		
4	<b>Cloud Implementation, Programming and Mobile Cloud Computing</b>	2	L1, L2, L3, L4
	Open Stack Cloud Architecture: Feature of Open stack, Components of Open stack, mode of operations. Mobile Cloud Computing: Definition, architecture, benefits and challenges of mobile cloud computing		
5	<b>Exploring the Components of Amazon Web Services</b>	2	L1, L2, L3, L4, L5
	AWS cloud computing Platform, a) Elastic Compute Cloud (EC2): Compute Basics, Instance types, Life cycle of instances. b) Simple Storage Service (S3): Basics and Operations, Features, Amazon Glacier. c) Elastic Block Storage (EBS): Basics and Types of EBS Volumes.		
6	<b>Cloud Backup and Solutions</b>	3	L1, L2
	Cloud Backup Solutions and their features, Cloud data management interface (CDMI), Cloud Storage gateways (CSG), Comparison between different cloud platforms: Amazon web services & Open stack (Based on Type of deployment, Services supported and their components).		
	<b>Total Hours</b>	<b>15</b>	

### **Books and References:**

	Title	Authors	Publisher	Edition	Year
1	Cloud Computing Bible	Barrie Sosinsky	Wiley Publication	Second Edition	2011
2	Cloud Computing Black Book	Kailash Jayaswal, Jagannath Kallalurchi, Donald J. Houde, Dr. Deven Shah	Dreamtech Press	Second Edition	2014
3	AWS certified solution Architect	Joe Baron et.al	Sybex publication	First Edition	2017
4	Mastering Cloud Computing: Foundations and Applications Programming	Rajkumar Buyya	MGH publication	First Edition	2013

### **Online Resources:**

S. No.	Website Name	URL	Modules Covered
1	Youtube.com	<a href="https://www.youtube.com/watch?v=EN4fEbcFZ_E">https://www.youtube.com/watch?v=EN4fEbcFZ_E</a>	M1-M6
2	Youtube.com	<a href="https://www.youtube.com/watch?v=r4YIdn2eTm4&amp;list=PLEiEAq2VkUULINtIFhEQHo8gacvme35rz">https://www.youtube.com/watch?v=r4YIdn2eTm4&amp;list=PLEiEAq2VkUULINtIFhEQHo8gacvme35rz</a>	M5
3	<a href="https://www.appypie.com/">https://www.appypie.com/</a>	<a href="https://www.appypie.com/basics-of-mobile-cloud-computing-and-mobile-cloud-applications">https://www.appypie.com/basics-of-mobile-cloud-computing-and-mobile-cloud-applications</a>	M4

### **List of Practical/ Experiments:**

Practical Number	Type of Experiment	Practical/ Experiment Topic	Hrs.	RBT Levels
1	Basic Experiments	Study of NIST model of cloud computing.	2	L1, L2, L3
2		Understand different types of virtualizations, Host and bare metal hypervisors and implement horizontal scalability.	2	L1, L2, L3
3	Design Experiments	Implement IaaS using specific tool	2	L1, L2, L3
4		Simulate identity management in a private cloud	2	L1, L2, L3
5		Explore Storage as a Service for remote file access using web interface.	2	L1, L2, L3
6		Understand security of web server and data directory.	2	L1, L2

7		Deploy web applications on commercial cloud.	4	L1, L2, L3, L4
8		To create and access VM instances and demonstrate various components such as EC2, S3, Simple DB, DynamoDB in AWS	4	L1, L2, L3, L4, L5
9	<b>Case study:</b>	Fog Computing	2	L1, L2, L3
10	<b>Mini Project:</b>	Using the concepts studied throughout the semester students shall be able to 1. Create their private cloud for the institute using the available resources. 2. Apply security concepts to secure a private cloud. 3. Implement efficient load balancing. 4. Compare various virtualization technologies with given resource. 5. Create cloud applications such as messenger, photo editing website, your own social media etc.	8	L1, L2, L3, L4, L5
<b>Total Hours</b>			<b>30</b>	

**B.E. Semester –VIII**
**Choice Based Credit Grading Scheme with Holistic Student Development (CBCGS-H 2019)**
**Syllabus under Autonomy (w.e.f. A.Y. 2021-22)**

B.E.( Computer Engineering )					B.E.(SEM : VIII)		
Course Name : Research Based Learning IV					Course Code : HSD-CSRBL801		
Teaching Scheme (Program Specific)					Examination Scheme (Formative/ Summative)		
Modes of Teaching / Learning / Weightage					Modes of Continuous Assessment / Evaluation		
Hours Per Week					Presentation	Report	Term Work
Theory	Tutorial	Practical	Contact Hours	Credits	AC	AC	TW
-	-	30	30	1	25	25	50
Audit course evaluated by Teacher Guardian							
Mid Semester Assessment for Term work will be on continuous basis							
<b>Prerequisite:</b> Subject knowledge, Domain knowledge							

**Course Objective:** The course intends to create awareness about Intellectual Property Rights, provides an opportunity to interact with industry and helps the students in publishing papers in Conferences and Journals and encourages them to take part in consultancy projects.

**Course Outcomes:** Upon completion of the course student will be able to:

S. No.	Course Outcomes	Cognitive levels of attainment as per Bloom's Taxonomy
1	Understand Intellectual Property Rights and its process in details	L1, L2
2	Interact with industry experts regarding their projects and analyse their projects from industry view point	L1, L2,L3
3	Evaluate their projects by publishing their project research in Conferences and Journals	L1, L2, L3, L4,L5
4	Write a research paper and understand technical writing.	L1, L2, L3,L4,L5



**Detailed Syllabus:**

Module No.	Topics	Contact Hrs.	Self-Study Hrs.	Cognitive levels of attainment as per Bloom's Taxonomy
1	<b>Intellectual Property Rights (IPR) awareness seminar</b> Seminar to be conducted by an industry expert who can guide and motivate students to file IPR.	02	00	L1, L2
2	<b>Industry linkage / visit related to product and domain/Establish start up</b> To understand the usability of their respective project students can visit an Industry and conduct a survey and generate a suitable report.	02	04	L1,L2,L3
3	<b>IPR filing/ Technology transfer to industry/Testing of product in real environment</b> Once the product is ready, it needs to be tested first in the real environment where it will be deployed and used by the end user. Once the product is tested ok, it can be deployed in the industry in a large scale. IPR/Patent can be suitably filed for the said product.	06	10	L1, L2, L3,L4,L5
4	<b>Publish paper at institute /national level conference /participate in competition /participate in funded project/consultancy projects</b> The completed project with results can be converted into a research paper and the same can be published in a conference or journal. Students can participate in project competitions at institute and university level. Also they can participate in funded projects and consultancy projects.	02	04	L1, L2, L3, L4,L5
	<b>Total Hrs.</b>	<b>12</b>	<b>18</b>	

**Books and References:**

S. No.	Title	Authors	Publisher	Edition	Year
1.	Blue Ocean Strategy	W Chan Kim and Renee Mauborgne	Harward Business School Press	1 <sup>st</sup>	2005
2.	The E-Myth Revisited	Michael E. Gerber	Harper-Collins Publications	1 <sup>st</sup>	2012
3.	Intellectual Property Rights	Neeraj Pandey and Kushdeep Dharni	Prentice Hall India	2nd	2014

**Online Resources:**

S. No.	Website Name	URL	Modules covered
1.	NPTEL	<a href="https://nptel.ac.in/courses/110105139/">https://nptel.ac.in/courses/110105139/</a>	M1,M3
2.	IPTSE	<a href="https://iptse.com/future-of-intellectual-property-rights-in-india/">https://iptse.com/future-of-intellectual-property-rights-in-india/</a>	M1, M3
3.	NPTEL	<a href="https://nptel.ac.in/courses/127105007/">https://nptel.ac.in/courses/127105007/</a>	M2