T.E. Semester-VI Syllabus

Choice Based Credit Grading Scheme with Holistic Student Development (CBCGS- H 2019)

TCET Autonomy Scheme (w.e.f. A.Y. 2020-21)

T.E. Semester –VI
Choice Based Credit Grading Scheme with Holistic Student Development (CBCGS- H 2019)
TCET Autonomy Scheme (w.e.f. A.Y. 2020-21)

B.E. (Information Technology)						T.E.(SEM : VI)			
Course Name :Data Ming and Business Intelligence						**Course Code : PCC-IT 601**			
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**	**OR**	**TW**	
3	1	2	6	5	25	75	25	25	**150**
IA: In-Semester Assessment- Paper Duration – **1.5 Hours** **ESE : End Semester Examination-** Paper Duration - **3 Hours** **Total weightage of marks for continuous evaluation of Term work/Report:** Formative (40%), Timely Completion of Practical (40%) and Attendance /Learning Attitude (20%).									
Prerequisite: Database Management System, Advanced Data Management Technology.									

Course Objective: The course intends to deliver the fundamentals of data mining as an important tool for enterprise data management which makes students well worse in data mining algorithms, methods of evaluation and also provide knowledge on how to gather and analyze large sets of data to gain useful business understanding.

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

Sr. No.	Course Outcomes	Cognitive levels of attainment as per Bloom's Taxonomy
1	Demonstrate an understanding of the importance of data mining and the principles of business intelligence .	L1, L2
2	Perform exploratory analysis of the data to be used for mining.	L1,L2,L3
3	Organize and Prepare the data needed for data mining using pre preprocessing techniques	L1,L2,L3,L4,L5
4	Implement the appropriate data mining methods like classification, clustering or Frequent Pattern mining on large data sets.	L1,L2,L3,L4,L5
5	Define and apply metrics to measure the performance of various data mining algorithms.	L1,L2,L3,L4,L5
6	Apply BI to solve practical problems : Analyze the problem domain, use the data collected in enterprise, apply the appropriate data mining technique, interpret and visualize the results and provide decision support	L1,L2,L3,L4,L5,L6

Detailed Syllabus:

Module No.	Topics	Hrs.	Cognitive levels of attainment as per Bloom's Taxonomy
0	**Prerequisite** Knowledge of databases and data warehousing, OLAP	02	---
1	**Introduction to Data Mining** What is Data Mining; kind of pattern to be mined; technologies used; kind of applications targeted, major issues in Data Mining	03	L1, L2
2	**Data Exploration and Data Preprocessing** Types of Attributes; Statistical Description of Data; Data Visualization; Measuring similarity and Dissimilarity; Why Preprocessing? Data Cleaning; Data Integration; Data Reduction: Attribute subset selection, Histograms, Clustering and Sampling; Data Transformation & Data Discretization: Normalization, Binning, Histogram Analysis and Concept Hierarchy generation	08	L1,L2,L3
3	**Frequent Pattern Mining** Market Based Analysis, Frequent Itemests, Closed Itemests and Association Rules; Frequent Itemest Mining Methods: The Apriori Algorithm for finding Frequent Itemsets using Candidate Generation, Generating Association Rules from Frequent Itemsets, A pattern growth approach for mining Frequent Itemsets; Mining Frequent itemsets using vertical data formats; Which patterns are interesting? Pattern evaluation methods.	08	L1,L2,L3,L4,L5
4	**Classification** Basic Concepts; Classification Methods; Decision Tree Induction: Attribute Selection Measures, Tree pruning; Bayesian Classification: "Naïve Bayes" Classifier; Rule based classification : using IF-THEN rule for classification; Accuracy and Error measures, Precision, Recall, Holdout, Random Sampling, Cross Validation.	08	L1,L2,L3,L4,L5
5	**Clustering** Cluster Analysis : Basic Concepts; Partitioning Methods: K-Mean, K-Medoids; Hierarchical Methods: Agglomerative, Divisive, BIRCH What are outliers? Types, Challenges; Outlier Detection Methods: Supervised, Semi Supervised, Unsupervised, Statistical, Proximity based, Clustering Based.	08	L1,L2,L3,L4,L5
6	**Business Intelligence** What is BI? Business Intelligence architecture; Definition of Decision support system, Development of business intelligence system Data mining for business application like fraud detection, clickstream mining, market segmentation, retail industry, telecommunication industry, banking & finance, CRM etc.	08	L1,L2,L3,L4,L5,L6
	Total Hr.	45	

List of Tutorials/Experiments:

Practical No.	Type of Experiment	Tutorial/Experiment topic	Hrs	Cognitive levels of attainment as per Bloom's Taxonomy
	Basic experiment	2 tutorials_		
1		a) Solving exercises in Data Exploration	3	L1, L2,L3
2		b) Solving exercises in Data preprocessing	3	L1, L2,L3
3	**Design Experiment**	Using open source tools implement Association Mining Algorithms	2	L1, L2,L3,L4,L5
4		Implementation of association mining algorithm using languages like JAVA/ python	2	L1, L2,L3,L4,L5
5		Using open source tools implement Classification algorithm	2	L1,L2,L3,L4,L5
6		Implementation of classification algorithm using languages like JAVA/ python	2	L1,L2,L3,L4,L5
7		Using open source tools implement Clustering Algorithms	2	L1,L2,L3,L4,L5
8		Implementation of Clustering Algorithms using languages like JAVA/ python	2	L1,L2,L3,L4,L5
9		Comparing Classifiers with different parameters	2	L1,L2,L3,L4,L5
10	**Group Activity/ Case study**	Detailed case study of any one BI tool (open source tools like Tabula can be used)	2	L1, L2,L3
11		**Business Intelligence Mini Project**: A BI report must be prepared outlining the following steps: a) Problem definition, identifying which data mining task is needed b) Identify and use a standard data mining dataset available for the problem. Some links for data mining datasets are: WEKA site, UCI Machine Learning Repository, KDD site, KDD Cup etc. c) Implement the data mining algorithm of choice d) Interpret and visualize the results e) Provide clearly the BI decision that is to be taken as a result of mining.	08	L1,L2,L3,L4,L5, L6
		Total Hrs.	30	

Books and References:

Sr. No.	Title	Authors	Publisher	Edition	Year
1.	Data Mining Concepts and Techniques	Jiawei Han, Micheline Kamber	Morgan Kaufmann	3rd	2012
2.	Data Mining for Business Intelligence: Concepts, Techniques, and Applications in Microsoft Office Excel with XLMiner	G. Shmueli, N.R. Patel, P.C. Bruce	Wiley	1st	2008
3.	Introduction to Data Mining	P. N. Tan, M. Steinbach, Vipin Kumar	Pearson Education	2nd	2006

Online Resources:

Sr. No.	Website Name	URL	Modules covered
1.	https://data-flair.training	https://data-flair.training/blogs/data-mining-tutorial/	M1,M2
2.	https://hanj.cs.illinois.edu	https://hanj.cs.illinois.edu/bk3/bk3_slidesindex.htm	M3,M4,M5
3.	https://data-flair.training	https://data-flair.training/blogs/business-intelligence/	M6
4.	http://people.sabanciuniv.edu	http://people.sabanciuniv.edu/berrin/cs512/lectures/WEKA/WEKA%20Explorer%20Tutorial-REFERENCE.pdf	M3,M4,M5

T.E. Semester –VI
Choice Based Credit Grading Scheme with Holistic Student Development (CBCGS- H 2019)
TCET Autonomy Scheme (w.e.f. A.Y. 2020-21)

B.E.(Information Technology)							T.E.(SEM : VI)			
Course Name : Software Engineering with Project Management							**Course Code : PCC- IT 602**			
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**	**OR**	**TW**		
3	-	2	5	4	25	75	25	25	**150**	
IA: In-Semester Assessment- Paper Duration – **1Hours** **ESE : End Semester Examination-** Paper Duration - **3 Hours** **Total weightage of marks for continuous evaluation of Term work/Report:** Formative (40%), Mini Project and presentation (40%) and Attendance /Learning Attitude (20%).										
Prerequisite: Object Oriented Paradigms, any one OOP language. Database management.										

Course Objective: The course intends to deliver the fundamentals of software engineering concepts and software development life cycle. Objective of the course is to provide the understanding of software life cycle process model, agile software development. It also focuses on concept concepts and principles of software design and user-centric approach and principles of effective user interfaces, testing methods and techniques, software quality assurance and configuration management, project management life cycle, project scheduling concept and risk management associated to various types of 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	Define various software application domains and remember different process model used in software development.	L1, L2
2	Explain needs for software specifications also they can classify different types of software requirements and their gathering techniques.	L1,L2,L3
3	Convert the requirements model into the design model and demonstrate use of software and user-interface design principles.	L2,L3,L4
4	Distinguish among SCM and SQA and can classify different testing strategies and tactics and compare them.	L1,L2,L3,
5	Justify role of SDLC in Software Project Development and they can evaluate importance of Software Engineering in PLC.	L1,L2,L3,L4
6	Generate project schedule and can construct, design and develop network diagram for different type of Projects. They can also organize different activities of project as per Risk impact factor.	L1,L2,L3,L4,L5

Detailed Syllabus:

Module No.	Topics	Hrs.	Cognitive levels of attainment as per Bloom's Taxonomy
0	**Prerequisite**	01	---
	Nature of Software, Software Definition, Software Characteristics, Software Application Domains		
1	**The Software Process**	07	L1, L2
	Generic view of Process, Prescriptive Models: Waterfall Model, Incremental-RAD Model, Evolutionary Process Model-Prototyping, Spiral and Concurrent Development Model, Specialized Models: Component based, Aspect Oriented Development, Agile Methodology, Scrum and Extreme Programming		
2	**Requirements Engineering and Cost Estimation**	07	L1,L2,L3
	Requirement, Types of Requirements, Requirement gathering, Requirement Engineering Task, Identifying Stakeholders, Multiple viewpoints, SRS (Software Requirement Specification) Project Estimation, LOC based, FP based and Use case based estimation.		
3	**Analysis and Design Engineering**	07	L2,L3,L4
	Introduction of Analysis elements, Scenario based, Flow based, behaviour and class based Design Concepts and Principles, Architecture Design, Component Level Design, System Level Design, User Interface Design.		
4	**Quality &Configuration Management**	07	L1,L2,L3,
	Need for Testing, Testing Tactics, Testing strategies, McCall's Quality Factor, Software Configuration Management, SCM Process		
5	**IT Project Management**	08	L1,L2,L3,L4
	Introduction, 4 P's, W5HHPrinciple, Need for Project Management, Project Life cycle and ITPM, Project Feasibility, RFP,PMBOK Knowledge areas, Business Case, Project Planning, Project Charter and Project Scope.		
6	**Project Scheduling and Risk Management**	08	L1,L2,L3,L4,L5
	WBS, Developing the Project Schedule, Network Diagrams(AON, AOA), CPM and PERT, Gantt Chart, Risk Identification, Risk Projection and RMMM		
	Total Hr.	45	

Mini Project Guide Lines

1. Students should take one case study as a mini project work which is to be conducted by a group of three students

2. Each group will be associated with a subject In charge/ mini project mentor. The group should meet with the concerned faculty during Laboratory hours and the progress of work discussed must be documented.

3. The students must be able to identify Object oriented Technologies, Basic expression of Classes, Attributes and operations.

4. Students must develop a Conceptual Model of the UML for above case study.

5. Students should define Classes, Relationships, Class Diagrams, Advanced Classes and Relationship, Object Diagrams for above case study.

6. Students should define Use Cases, Use case Diagrams, Activity Diagrams, Interaction Diagrams, State Chart Diagrams for above case study.

7. Students should define Components, Deployment, Collaborations, Component Diagrams, and Deployment Diagrams for above case study

8. Students should define SRS, WBS, Network Diagram, Gantt chart, and Cost Estimation Techniques

9. Demonstration it using Scrum Tool

10. Each group may present their work in various project competitions and paper presentations.

11. A detailed report is to be prepared as per guidelines given by the concerned faculty.

Books and References:

Sr. No.	Title	Authors	Publisher	Edition	Year
4.	Software Engineering : A Practitioner's Approach	Roger S Pressman	McGraw-Hill	7th Edition	2010
5.	Information Technology Project Management	Jack T. Marchewka,	Wiley India	4th Edition	2016
6.	Software Engineering	Ian Sommerville	Pearson Education	9th edition	2011

Online Recourses:

Sr. No.	Website Name	URL	Modules covered
5.	https://nptel.ac.in	https://nptel.ac.in/courses/106101061/ https://nptel.ac.in/courses/106105087/	M1,M2
6.	https://nptel.ac.in	https://nptel.ac.in/courses/106108103/	M3
7.	https://www.guru99.com	https://www.guru99.com/software-configuration-management-tutorial.html	M4
8.	https://nptel.ac.in	https://nptel.ac.in/courses/110107081/	M5,M6

T.E. Semester –VI
Choice Based Credit Grading Scheme with Holistic Student Development (CBCGS- H 2019)
TCET Autonomy Scheme (w.e.f. A.Y. 2020-21)

BE (Information Technology)					T.E.(SEM : VI)				
Course Name :Automata Theory					**Course Code :PCC –IT 603**				
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**	
03	01	-	04	04	25	75	-	25	125
IA: In-Semester Assessment- Paper Duration – **1.5 Hours**									
ESE : End Semester Examination- Paper Duration - **3 Hours**									
Total weightage of marks for continuous evaluation of Term work/Report: Formative (40%), Timely Completion of Practical (40%) and Attendance /Learning Attitude (20%).									
Prerequisite: Discrete Structures and Graphs Theory (e.g. Graphs, Trees, Logic and Proof Techniques) and also familiar with common Data Structures, Recursion, and the role of major system components such as Compilers									

Course Objectives:

This course aims to build concepts regarding the fundamental principles of Grammars, Automata Theory, Turing Machines, Push down Automata, Undecidability and Intractable Problems

Course Outcomes:

Sr No	Course Outcomes	Cognitive levels of attainment as per Bloom's Taxonomy
1.	Understand & Design different types of Finite Automata and Machines as Acceptor, Verifier and Translator	L1,L2,L3,L4
2.	Understand Regular languages, Expression and Grammars and conversion from FA to RE and Vice versa	L1,L2,L3,L4
3.	Understanding and Apply Pumping Lemma concept and prove the whether language is regular or not.	L1,L2,L3,L4
4.	Understand, construct, analyze and interpret Context Free Grammar and Context Free languages and understand conversion process	L1,L2,L3,L4,L5,L6
5.	Design and Develop different types of Push down Automata as Simple Parser.	L1,L2,L3,L4,L5,L6
6.	Design different types of Turing machine as a computing machine and also understand properties of Recursive and recursively enumerable languages	L1,L2,L3,L4,L5,L6

Detailed Syllabus:

Module No.	Topics	Hrs.	Cognitive levels of attainment as per Bloom's Taxonomy
1	**Introduction**	**08**	
	Alphabets, Strings and Languages, automata and Grammars. Finite. Automata (FA) -its behavior; DFA -Formal definition, simplified notations (state transition diagram, transition table), Language of a DFA. NFA -Formal definition, Language of an NFA. An Application: Text Search, FA with epsilon-transitions, Eliminating epsilon-transitions, Equivalence of DFAs and NFAs.		L1,L2,L3,L4
2	**Regular Expression & Finite Automata**	**07**	
	Regular expressions (RE) - Definition, FA and RE, RE to FA, FA to RE, algebraic laws for RE, applications of REs, Regular grammars and FA, FA for regular grammar, Regular grammar for FA, DFA Minimization Some decision properties of Regular languages -emptiness, finiteness, membership, equivalence of two DF As or REs, Finite automata with output.		L1,L2,L3,L4
3	**Regular languages & Pumping Lemma**	**04**	
	Proving languages to be non-regular - Pumping Lemma, and its applications. Some closure properties of Regular languages - Closure under Boolean operations, reversal, homomorphism, inverse homomorphism, etc. Myhill-Nerode Theorem.		L1,L2,L3,L4
4	**Context-free Grammar and Context Free Language**	**10**	L1,L2,L3,L4 L5,L6
	Formal definition, sentential forms, leftmost and rightmost derivations, the language of a CFG. Derivation tree or Parse tree- Definition, Relationship between parse trees and derivations. Parsing and ambiguity, Application of CFGs, Ambiguity in grammars and Languages. Simplification of CFGs - Removing useless symbols, epsilon-Productions, and unit productions, Normal forms - CNF and GNF. Proving that some languages are not context free -Pumping lemma for CFLs, applications. Some closure properties of CFLs -Closure under union, concatenation, Kleene closure, substitution, Inverse homomorphism, reversal, intersection with regular set, etc. Some more decision properties of CFLs, Review of some undecidable CFL problems. Context sensitive Grammar and linear bounded Automata		
5	**Pushdown Automata & Context Free Language**	**07**	
	Formal definition, behavior and graphical notation, Instantaneous descriptions (Ids), The language of PDA (acceptance by final state and empty stack) . Equivalence of acceptance by final state and empty stack, Equivalence of PDAs and CFGs, CFG to PDA, PDA to CFG. DPDAs - Definition, DPDAs and Regular Languages, DPDAs, Multistack DPDAs & NPDAs and CFLs. Languages of DPDAs, NPDAs, and ambiguous grammars		L1,L2,L3,L4,L5 L6
6	**Turing Machines, Undecidability and Recursively Enumerable Languages**	**09**	L1,L2,L3,L4,L5 ,L6

Formal definition and behavior, Transitions (diagrams, Functions and Tables) Language of a TM, Design of TM as generator, decider and acceptor. , etc. Variants of TM: Non-deterministic, Multitrack, Multitape, Universal TM. Equivalence of Single and Multi Tape TMs, Power and Limitations of TMs, Design of Single and Multi Tape TMs as a computer of simple functions: Unary, Binary (Logical and Arithmetic), String operations (Length, Concat, Match, Substring Check, etc) Recursive and recursively enumerable languages, Properties of recursive and recursively enumerable languages, A language that is not recursively enumerable. The universal language, Undecidability of the universal language, The Halting problem, Post's Correspondence Problem (PCP) -Definition, Undecidability of PCP.		
Total Hours	**45**	

Books and References:

Sr. No	Title	Authors	Publisher	Edition	Year
1.	Introduction to languages and the Theory of Computation	J.C.Martin	Tata McGraw Hill	2ⁿᵈ	2009
2.	Theory of Computation A Problem Solving Approach	Kavi Mahesh	Wiley India	1ˢᵗ	2011
3.	Introduction to Automata Theory, Languages and Computation	John E. Hopcroft, Jeffrey D. Ullman	Pearson Education.	3ʳᵈ	1979
4.	Theory of Computation	Vivek Kulkarni	Oxford University	1ˢᵗ	2013
5.	Theory of Computer Science, Automata Languages & Computations	N.Chandrashekhar & K.L.P. Mishra	PHI publications.	3ʳᵈ	2006
6.	Introductory Theory of Computer Science	Krishnamurthy E.V	East-West press	2ⁿᵈ	2009

List of Tutorials:

Sr No	Tutorials topic	Hrs.	Cognitive levels of attainment as per Bloom's Taxonomy
1	Design a FSM for the given language	1	L1,L2,L3,L4
2	Construct DFA accepting the given language	1	L1,L2,L3,L4
3	Construct a non-deterministic finite automaton (NFA) for each of the given language And find equivalent DFA for given NFA.DFA Minimization problems from previous old university question papers	2	L1,L2,L3,L4
4	Design Moore & Mealy machine for given language ,Convert given Moore machine into Mealy machine & Convert following Mealy machine into Moore machine	1	L1,L2,L3,L4
5	Construct a regular expression (RegEx) for given language and describe the language of the RegEx as concisely as possible.	1	L1,L2,L3,L4
6	Write Context Free grammar for given problem statement convert CFG into CNF & GNF form Write derivations for given CFG	1	L1,L2,L3,L4
7	Design PDA for the given language	2	L1,L2,L3,L4,L5
8	Convert CFG into PDA & Vice versa.	2	L1,L2,L3,L4,L5
9	Design Turing Machines for the given language	2	L1,L2,L3,L4,L5,L6
10	Case study Experiment	2	L1,L2,L3,L4,L5,L6
	Total Hours	15	

Online References:

Sr. No	Website Name	URL	Modules covered
1.	https://www.tutorialspoint.com	hhttps://www.tutorialspoint.com/automata_theory/index.htm	M1 to M6
2.	https://www.javatpoint.com	https://www.javatpoint.com/automata-tutorial	M1 to M6
3.	http://www.infolab.stanford.edu	http://www.infolab.stanford.edu/~ullman/ialc.html	M1 to M6
4.	http://www.jflap.org/	http://www.jflap.org/	M1 to M6
5.	https://nptel.ac.in	https://nptel.ac.in/courses/111103016/	M1 to M6
6.	https://www.udemy.com	https://www.udemy.com/course/theory-of-automata/	M1 to M6

T.E. Semester-VI
Choice Based Credit Grading Scheme with Holistic Student Development (CBCGS- H 2019)
TCET Autonomy Scheme (w.e.f. A.Y. 2020-21)

B.E (Information Technology)							T.E.(SEM : VI)		
Course Name: Ethical hacking and Digital Forensics							**Course Code : PEC- IT 6011**		
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**	**OR**	**TW**	
3	-	2@	5	4	25	75	25	25	**150**
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%) @ Capstone Project									
Prerequisite: Cryptography and Security, Computer Networks									

Course Objective:

The course intends to deliver the fundamentals of current cyber security issues, knowledge about ethical hacking Methodology, various tool of ethical hacking, underlying principles and techniques associated with the digital forensic practices and cybercrime, importance of evidence handling and storage for various devices, investigation of attacks and apply digital forensic knowledge to use computer forensic tools, investigate attacks and report writing.

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 the concept of ethical hacking and its associated applications in Information Communication Technology (ICT) world.	L1, L2
2	Explore ,apply and analysis the various ethical hacking tools using kali linux	L1,L2,L3,L4
3	Underline the need of digital forensic and role of digital evidences.	L1, L2
4	Explain the methodology of incident response and various security issues in ICT world, and identify digital forensic tools for data collection.	L1, L2,L3
5	Recognize the importance of digital forensic duplication and various tools for analysis to achieve adequate perspectives of digital forensic investigation in various applications /devices like Windows/Unix system.	L1, L2, L3,L4
6	List the method to generate legal evidence and supporting investigation reports and will also be able to use various digital forensic tools.	L1, L2, L3,L4

Detailed Syllabus:

Module No.	Topics	Hrs.	Cognitive levels of attainment as per Bloom's Taxonomy
1	**Introduction to Cyber Crime and Ethical Hacking** Introduction of Cybercrime: Types of cybercrime, categories cybercrime, Computers' roles in crimes, Prevention from Cybercrime, Hackers, Crackers, Phreakers. Ethical Hacking :Difference between Hacking and Ethical hacking : Steps of Ethical Hacking, Need of ethical hackers , advantage and limitation of hacking, Skill of ethical hackers	5	L1, L2
2	**Ethical Hacking tools with kali Linux** Installation of kali linux and configuration , Information gathering tools –Nmap , Zeen Map , Stealth Scan, Searchsploit, DNS Tools, Hping3 Vulnerability Analyses Tools- Cisco Tools, Cisco Auditing Tool, BED , Website Penetration testing tool- Vega usage, ZapProxy, Database tool – Sqlmap, exploring to Sql Injection, Social engineering tool-SET, Sniffing & Spoofing	10	L1,L2,L3,L4
3	**Introduction to Digital Forensics and Digital Evidences** Digital Forensic, Rules for Digital Forensic The Need for Digital Forensics, Types of Digital Forensics, Ethics in Digital Forensics Digital Evidences: Types and characteristics and challenges for Evidence Handling.	5	L1, L2
4	**Computer Security Incident Response Methodology** Introduction to Computer Security Incident -Goals of Incident response, Incident Response Methodology, Formulating Response Strategy. IR Process – Initial Response, Investigation, Remediation, Tracking of Significant, Investigative Information, Reporting Pre-Incident Preparation, Incident Detection and Characterization. Live Data Collection: Live Data Collection on Microsoft Windows Systems, Live Data Collection on Unix-Based Systems	8	L1, L2,L3
5	**Forensic Duplication and Disk Analysis, and Investigation** Forensic Duplication: Forensic Image Formats, Duplication, Live System Duplication, Forensic Duplication tools. Disk and File System Analysis: Media Analysis Concepts, File System Abstraction Model Partitioning and Disk Layouts : Partition Identification and Recovery, Redundant Array of Inexpensive Disks Special Containers : Virtual Machine Disk Images , Forensic Containers Hashing,Carving :Foremost Forensic Imaging : Deleted Data , File Slack , dd , dcfldd , dc3dd Data Analysis: Analysis, Methodology Investigating Windows systems, Investigating UNIX systems ,Investigating Applications, Web Browsers, Email, Malware Handling: Static and Dynamic Analysis	8	L1, L2, L3,L4
6	**Forensic Investigation Report and Forensic Tools** Investigative Report, Guidelines for Writing a Report, sample for writing a forensic report. Computer Forensic Tools: need and types of computer forensic tools, task performed by computer forensic tools. Study of open source Tools like SFIT, Autopsy etc. to acquire, search, analyze and store digital evidence	9	L1, L2, L3.L4
	Total Hrs.	45	

Capstone Project hours:

Work to be done	Hrs.	Cognitive levels of attainment as per Bloom's Taxonomy
Identification and Study ethical hacking and forensic tools	4	L1,L2
Project Title Identification	2	L1,L2
Understand the digital evidence and note down the observations	2	L1,L2,L3
Perform duplication and acquisition using software and hardware tools of digital forensic	4	L1,L2,L3
Design and develop system for live data collection for digital forensic of identified project	6	L1,L2,L3,L5
Perform data analysis using various tools of digital forensic for identified project	4	L2,L3,L4
Design or use the tool for network forensic for identified project	4	L2,L3
Preparation forensic investigation report of your project	4	L1,L2,L3,L
Total Hours	**30**	

Books and References:

Sr. No.	Title	Authors	Publisher	Edition	Year
1.	Digital Forensic : The fascinating world of Digital Evidences	Nilakshi Jain, Dhananjay Kalbande	Wiley publication	1ˢᵗ edition	2017
2.	Incident Response and computer forensics	Jason Luttgens, Matthew Pepe, Kevin Mandia	Tata McGraw Hill,	3rd Edition	2014
3.	Network Security Assessment	Chris McNab	O'Reily	2nd edition	2013
4.	Digital Forensics for Network, Internet, and Cloud Computing A forensic evidence guide for moving targets and data	Clint P Garrison	Syngress Publishing, Inc.	1st edition	2010
5.	Scene of the Cybercrime: Computer Forensics Handbook	Debra Littlejohn Shinder Michael Cross	Syngress Publishing	2nd edition	2008

Online References

Sr. No.	Website Name	URL	Modules Covered
1	https://www.itu.int	https://www.itu.int/en/ITU-D/Cybersecurity/Documents/Introduction%20to%20the%20Concept%20of%20IT%20Security.pdf	M1
2	https://onlinecourses.nptel.ac.in https://www.tutorialspoint.com	https://onlinecourses.nptel.ac.in/noc19_cs68/preview https://www.tutorialspoint.com/kali_linux/index.htm	M2
2	https://searchsecurity.techtarget.com	https://searchsecurity.techtarget.com/definition/incident-response	M3
3	https://www.educba.com	https://www.educba.com/32-most-important-cyber-security-tools/	M4,M5
4	https://digital-forensics.sans.org	https://digital-forensics.sans.org/blog/2010/08/25/intro-report-writing-digital-forensics/	M6

T.E. Semester –VI
Choice Based Credit Grading Scheme with Holistic Student Development (CBCGS- H 2019)
TCET Autonomy Scheme (w.e.f. A.Y. 2020-21)

B.E. Information Technology							T.E. SEM: VI		
Course Name: Computer Graphics & Virtual Reality							**Course Code: PEC-IT 6012**		
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**	**OR**	**TW**	
3	-	2@	5	4	25	75	25	25	**150**
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%) @ Capstone Project									
Prerequisite: mathematics & any programming language **RBT :** Revised Bloom's Taxonomy									

Course Objectives: The course intend to deliver the fundamentals of components of graphics system and apply 3-dimensional computer graphics to convert geometrical primitives, transform shapes, develop computer games, information visualization business applications and analyze the fundamentals of animation, virtual reality.

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

Sr. No.	Course Outcomes	RBT level
1	Understand basic concepts used in computer graphics.	L1, L2
2	Implement various algorithms to scan, convert the basic geometrical primitives, transformations, Area filling, clipping.	L1, L2, L3,L4,
3	Implement & Describe the importance of viewing and projections.	L1, L2, L3,L4
4	Define the fundamentals of animation, virtual reality and its related technologies.	L1, L2, L3,L4
5	Understand a typical graphics pipeline.	L1, L2
6	Understand & explain Modeling & programming in VR	L1, L2,L3

Detailed Syllabus:

Module No.	Topics	Hrs.	RBT Levels
	Prerequisites	-	
	Basic mathematics & any programming language		
1	**Introduction to Computer graphics and Output primitives1**	8	
	Display Devices, Bitmap and Vector based graphics, Overview of Coordinate System. **Scan Conversion of:** point, line using Digital differential analyzer & Bresenham's algorithm, circle using midpoint approach, **Curve Generation:** Bezier and B-Spline curves. Introduction to fractals: generation procedure, classification, dimension and Koch Curve.		L1, L2
2	**Area Filling, Transformations (2D & 3D)**	8	L1, L2, L3,L4
	Area filling: Inside/Outside Test, Scan line Polygon Fill Algorithm, Boundary Fill and Flood Fill algorithm. Basic Geometrical 2D Transformations: Translation, Rotation, Scaling, Reflection, Shear, their homogeneous Matrix representation and Composite transformation.Three Dimensional transformations: Translation, Scaling, Rotations, Composite		
3	**Viewing (2D and 3D) Projection and Clipping**	6	L1, L2, L3,L4
	Viewing: Introduction, Viewing Pipeline, View Coordinate reference frame, Window to viewport transformation. Three-Dimensional Viewing: 3D Pipeline, Viewing transformation, Projections: Parallel (Oblique and orthographic), Perspective (one point) ,Clipping: Point clipping, Line clipping: Cohen Sutherland Algorithm, Liang Barsky algorithms,Polygon clipping: Sutherland Hodgeman polygon clipping and Weiler Atherton. Text Clipping		
4	**Introduction to Animation**	5	L1, L2,L3,L4
	Animation: Key Frame Animation, Animation Sequence, Motion Control Methods, **Morphing, Warping**- Mesh Warping.		
5	**Introduction to Virtual Reality**	8	
	Virtual Reality: Basic Concepts, Overview and perspective on virtual reality, Human sensation and perception. Classical Components of VR System, Types of VR Systems, Three-Dimensional Position Trackers, Navigation and Manipulation Interfaces, Gesture Interfaces, Input Devices, Graphical Display, Sound displays, and Haptic Feedback. Graphical Rendering Pipeline, Haptic Rendering Pipeline, Open GL rendering pipeline.		L1, L2
6	**VR Modeling and Programming**	8	
	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		L1, L2,L3
	Total Hours	45	

Capstone Project:

Work to be done	Hrs.	Cognitive levels of attainment as per Bloom's Taxonomy
Identification and Study of computer graphics commands & loading graphics driver on system, implementation of viewing and clipping.	4	L1,L2,L3
Project Title Identification	2	L1,L2,L3
Modelling or prototype design	2	L1,L2,L3
Graphics Design	8	L1,L2,L3,L4,L5
Implementation	8	L1,L2,L3,L4,L5
Testing of Mini Project	2	L1,L2,L3,L4,L5
Preparation of Report	4	L1,L2,L3,L4,L5
Total Hours	**30**	

Books and References:

Sr. No.	Title	Authors	Publisher	Edition	Year
1	Computer Graphics	Donald Hearn and M. Pauline Baker	Pearson Education.	Second	2008
2	Computer Graphics with Virtual Reality	R. K Maurya	Wiley India	First	2009
3	Virtual Reality Technology	Grigore Burdea, Philippe Coiffet	Wiley	Second	2005
4	Computer Graphics	Steven Harrington	McGraw Hill	First	2007
5	Procedural Elements of Computer Graphics	Rogers	Tata McGraw Hill	First	2001
6	Virtual Reality Systems	Vince	Pearson Education	First	2007
7	Computer Graphics using Open GL	F.S. Hill, Stephen M. Kelley	Prentice Hall	First	2007
8	Learning OpenCV 3 Application Development	Samyak Datta	Packt	First	2016

Online References:

Sr. No.	Website Name	URL	Modules Covered
1	https://www.tutorialspoint.com/computer_graphics/	http://ecomputernotes.com/computer-graphics/basic-of-computer-graphics/introduction-to-computer-graphics, https://www.tutorialspoint.com/computer_graphics/computer_graphics_basics.htm, https://www.tutorialspoint.com/computer_graphics/line_generation_algorithm.htm, https://www.tutorialspoint.com/computer_graphics/circle_generation_algorithm.htm, https://www.tutorialspoint.com/computer_graphics/computer_graphics_curves.htm	M1
2	https://www.tutorialspoint.com/computer_graphics/	https://www.tutorialspoint.com/computer_graphics/2d_transformation.htm, https://www.tutorialspoint.com/computer_graphics/3d_transformation.htm	M2
3	https://www.tutorialspoint.com/computer_graphics/	https://www.tutorialspoint.com/computer_graphics/viewing_and_clipping.htm	M3
4	https://www.tutorialspoint.com/computer_graphics/	https://www.tutorialspoint.com/computer_graphics/computer_animation.htm	M4
5	https://www.marxentlabs.com/what-is-virtual-reality/, https://www.vrs.org.uk/virtual-reality-applications/	https://www.marxentlabs.com/what-is-virtual-reality/, https://www.vrs.org.uk/virtual-reality-applications/, http://www.iamwire.com/2017/10/19-ways-on-how-to-get-the-most-from-virtual-reality/167724, https://www.realitytechnologies.com/virtual-reality/	M5
6	https://www.explainthatstuff.com/virtualreality.html	https://www.explainthatstuff.com/virtualreality.html http://what-when-how.com/Tutorial/topic-8032kh/Interactive-Web-Based-Virtual-Reality-with-Java-3D-22.html, https://www.whoishostingthis.com/resources/vrml/	M6

T.E. Semester –VI
Choice Based Credit Grading Scheme with Holistic Student Development (CBCGS- H 2019)
TCET Autonomy Scheme (w.e.f. A.Y. 2020-21)

T.E. (Information Technology)							T.E. (SEM: VI)			
Course Name: Advanced Data Structures & Analysis of Algorithms							**Course Code: PEC-IT 6013**			
Contact Hours Per Week : 3							**Credits : 4**			
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**		**Oral**	**TW**	
3	-	2@	5	4	25	75		25	25	**150**
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%) @ Capstone Project										
Prerequisite: Data Structure and Algorithms **RBT :** Revised Bloom's Taxonomy										

Course Objective: The course intends to apply the concept of Advanced Data Structures

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

Sr. No.	Course Outcomes	RBT level
1	Choose appropriate advanced data structure for given problem	L1,L2,L3,L4,L5,L6
2	Calculate complexity of the problem	L1,L2,L3
3	Select appropriate design techniques to solve real world problems	L1,L2,L3,L4
4	Analyze the dynamic programming technique to solve the problems	L1,L2,L3,L4
5	Analyze the greedy programming technique to solve the problems	L1,L2,L3,L4
6	Select a proper pattern matching algorithm for given problem	L1,L2,L3,L4,L5,L6

Detailed Syllabus:

Module No.	Topics	Hrs.	RBT Levels
	Prerequisites	-	
	Knowledge Any Programming Language, Data structures and Analysis		
1	**Introduction Advanced Data Structures**	8	
	Introduction to advanced data structures: Introduction/Fundamentals of the analysis of algorithms. Recurrences: The substitution method, Recursive tree method, Masters method. Probabilistic analysis, Amortized analysis, Randomized algorithms, Mathematical aspects and analysis of algorithms		L1,L2,L3,L4,L5, L6
2	**Advanced Data Structures**	8	
	Introduction. AVL tree, Huffman algorithm, B/B+ tree, 2-3 tree operations, Red-Black Trees, tries, Heap operations, Implementation of priority, queue using heap, Topological sort		L1,L2,L3
3	**Divide and Conquer**	7	
	Introduction. Binary search, Finding the minimum and maximum, Merge sort, Quick sort, Strassen's matrix multiplication, Analysis of All problems		L1,L2,L3,L4
4	**Greedy algorithms**	8	
	Introduction. Knapsack problem, Job sequencing with deadlines, Minimum cost spanning trees, Kruskal's algorithm, Prim's algorithm. Optimal storage on tapes, Optimal merge pattern, Subset cover problem, Container loading problem. Analysis of All problems		L1,L2,L3,L4
5	**Dynamic algorithms & NP-Hard and NP-Complete**	8	
	Introduction Dynamic algorithms. All pair shortest path, 0/1 knapsack, Travelling salesman problem, Coin Changing Problem, Matrix Chain Multiplication, Flow shop scheduling, Optimal binary search tree (OBST), Analysis of All problems, Introduction to NP-Hard And NP-complete Problems		L1,L2,L3,L4
6	**String Matching**	6	
	Introduction. The naïve string matching algorithm, Rabin Karp algorithm, Knuth-Morris-Pratt algorithm (KMP), Longest common subsequence(LCS), Analysis of All problems, Genetic algorithms		L1,L2,L3,L4,L5, L6
	Total Hours	45	

Capstone Project Hours Distribution:

S NO	Work to be done	No. of Hours	Cognitive levels of attainment as per Bloom's Taxonomy
1	Study Research papers, articles, mini project title identification	4	L1,L2
2	Project Title finalization and development of Modules	2	L1,L2
3	Design methodology and tools for implementation	4	L1,L2
4	Implementation of Modules phase 1	4	L1,L2,L3
5	Result Phase I	2	L1,L2,L3,L4
6	Implementation of Modules Phase 2	4	L1,L2,L3
7	Result Phase II	2	L1,L2,L3,L4
8	Testing	2	L1,L2,L3,L4
9	Result validation	2	L1,L2,L3,L4,L5
10	Report Writing	4	L1,L2
	Total Hours	**30**	

Books and References:

Sr. No	Title	Authors	Publisher	Edition	Year
1	Introduction to ALGORITHMS	Cormen, Leiserson, Rivest, Stein	PHI	3rd Edition	2011
2	Algorithms: Design and Analysis	Harsh Bhasin	Oxford Publication	3rd Edition	2016
3	Fundamentals of Computer	Horowitz, Sahani, Rajsekaran	Universities Press	2nd	2005

	Algorithms				
4	C and Data structures	Deshpande, Kakde	Dream Tech	3rd	2017
5	Data Structures and Algorithms in C++	Goodritch, Tamassia, Mount	Wiley	1st	2011

Online Resources

S. No.	Website Name	URL	Modules Covered
1.	NPTEL	https://nptel.ac.in/courses/106102064/	M1
2.	NPTEL	https://nptel.ac.in/courses/106102064/6	M2
3.	NPTEL	https://nptel.ac.in/courses/106102064/14	M3
4.	NPTEL	https://nptel.ac.in/courses/106102064/33	M4
5.	Tutorials point.com	https://www.tutorialspoint.com/analysis_of_algo rithm/dynamic_programming_travelling_salesm an_problem.asp	M5
6.	Technopedia.com	https://www.techopedia.com/definition/17137/ge netic-algorithm	M6

T.E. Semester –VI

Choice Based Credit Grading Scheme with Holistic Student Development (CBCGS- H 2019)
TCET Autonomy Scheme (w.e.f. A.Y. 2020-21)

B.E. (Information Technology)							T.E. (SEM: VI)		
Course Name: Internet of Everything							**Course Code: PEC-IT-6014**		
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 (50)**	**Term Work (25)**	**Total**
Theory	**Tutorial**	**Practical**	**Contact Hours**	**Credits**	**IA**	**ESE**	**OR**	**TW**	
3	-	2 @	5	4	25	75	25	25	**150**
IA: In-Semester Assessment- Paper Duration – **1.5 Hours** **ESE:** End Semester Examination- Paper Duration - **3 Hours** **Total weightage of marks for continuous evaluation of Term work/Report:** Formative (40%), Timely Completion of Practical (40%) and Attendance /Learning Attitude (20%). @: Professional Elective Courses Lab will be conducted in the form Capstone Project									
Prerequisite: IOT Lab, Sensor Lab, Wireless Network									

Course Objective: The course intends to deliver the fundamentals of IOT concepts used for smart city development, IoT technologies, applications, protocols, and analytics of data in IOT. Also make real life application with the help of different design platforms used for an embedded systems application like Arduino and raspberry-pi.

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	Apply the concepts of MPMC & IOT	L1, L2,L3
2	Identify & Understand the IOE Enabling technology & RFID Technology	L1, L2,L3
3	Apply Knowledge on RFID Case Study & different applications	L1, L2,L3
4	Analysis and evaluate protocols used in IOT	L1, L2,L3,L4
5	Design and develop smart city in IOT	L1, L2,L3,L4, L5,L6
6	Analysis and evaluate the data received through sensors in IOT	L1, L2,L3,L4,L5

Detailed Syllabus:

Module No.	Topics	Hrs.	Cognitive levels of attainment as per
0	**Prerequisite**		L1,L2
	Introduction to Arduino, Raspberry Pi. Basics of Arduino programming, Extended Arduino libraries. Sensors, Sensor Types and Interfacing: Temperature, Pressure, Humidity sensors & Sensor family.		
1	**Introduction**	06	L1, L2,L3
	Introduction to IOT, History of IOT, Objects/things in the IOT, Identifier in IOT, Enabling Technologies in IOT: Identification Technology, Sensing and actuating, Other technologies, Connected object's communication, about the Internet in IOT.		
2	**RFID Technology**	06	L1,L2,L3
	Introduction to RFID, IOT & RFID Technology, Components of RFID System: RFID Tag, Types of Tags, RFID Readers. Principal of RFID, RFID middleware, Issues.		
3	**RFID Application and Challenges**	09	L1, L2, L3,L4
	RFID Applications: logistics and supply chain, production, monitoring and maintenance, product safety, quality and information, access control and tracking and tracing of individuals, payment, loyalty, household etc., Challenges of RFID Technology , Hardware, Hardware issues, protocols: pure aloha, slotted aloha, frame slotted aloha, tree protocols, tree splitting algorithms, binary search algorithms, bitwise arbitration protocols. Main query tree protocols.		
4	**Wireless Sensor Networks**	09	L1, L2, L3, L4,L5
	Introduction to wireless sensor Network, Components of WSN, Types of Wireless Sensor Network Node: Connecting Nodes, Networking Nodes. Architecture of WSN, Securing Communication, Standards and Fora. Networking and Internet - IP Addressing, Protocols - MQTT, CoAP, REST Transferring data. WSN Protocols.		
5	**Mobility and Settings**	08	L1, L2, L3, L4, L5
	Introduction, localization, mobility management, localization and handover management, technology considerations, performance evaluation, simulation setup, performance results. Identification of IOT (Data formats, IPv6, identifiers and locaters, tag etc.)		
6	**Tools & Application for IOE**	07	L1, L2, L3, L4, L5
	Introduction, Apache, Hadoop, Using Hadoop MapReduce for Batch Data Analysis, Using Apache Storm for Real-time Data Analysis, Agriculture & Health Monitoring Case Study. Tools for IOT: Chef, Chef Case studies, Puppet, Puppet Case Study		
	Total Hrs	45	

Capstone Project:

Work to be done	Hrs.	Cognitive levels of attainment as per Bloom's Taxonomy
Survey for different IoT application using Raspberry pi/Arduino etc	2	L1,L2,L3
IoE Project Title Identification	2	L1,L2,L3
Identify the Hardware and software requirement for their mini project problem statement.	4	L1,L2,L3
Prototype/Design your own circuit board using Raspberry pi/Arduino/sensors/RFID	4	L1,L2,L3
Working Implementation and do coding to for input devices on board.	6	L1,L2,L3,L4
Create and interface using Web to publish or remotely access the data on Internet.	4	L1,L2,L3,L4
Present work in various project competitions / paper presentations etc	4	L1,L2,L3,L4,L5
Testing of Mini Project/case Study	2	L1,L2,L3,L4,L5
Reports Design & Preparation	2	L1,L2,L3,L4,L5
Total Hours	**30**	

Books and References:

Sr. No.	Title	Authors	Publisher	Edition	Year
1.	Internet of Things connecting objects to the web	Hakima Chaouchi	Wiley	1ˢᵗ	2010
2.	Internet of Things (A Hands-on Approach)	Arshdeep Bhaga and Vijay Madisetti.	--	---	2014
3.	The Internet of Things	Samuel Greengard	MIT Press	2ⁿᵈ	2015
4.	RFID and the Internet of Things	Herve chabanne	Wiley	1ˢᵗ	2013
5.	Fundamentals of Sensor Network Programming: Applications and Technology	S. Sitharama Iyengar, Nandan Parameshwaran, Vir V. Phoha, N. Balakrishnan, Chuka D.	John Wiley & Sons	1ˢᵗ	2010
6.	Building the internet of things with ipv6 and mipv6, The Evolving World of M2M	Daniel Minoli	John Wiley & Sons	1ˢᵗ	2013
7.	6LoWPAN: The Wireless Embedded Internet	Zach Shelby, Carsten Bormann	Wiley	1ˢᵗ	2009

8.	Interconnecting Smart Objects with IP: The Next Internet	Jean-Philippe Vasseur, Adam Dunkels, Morgan Kuffmann	Elsevier	1ˢᵗ	2010
9.	Designing the Internet of Things	Adrian McEwen (Author), Hakim Cassimally	John Wiley & Sons	1ˢᵗ	2013
10.	Internet of Things: Converging Technologies for Smart Environments and	Dr. Ovidiu Vermesan, Dr. Peter Friess	River Publishers	1ˢᵗ	2013
11.	Internet of Things (A Hands-on- Approach)	Vijay Madisetti , Arshdeep Bahga	John Wiley & Sons	1ˢᵗ	2014
12	ARM System on chip Architecture	Steve Furber	Pearson	2nd	2012
13	Getting Started with Arduino: The Open Source Electronics Prototyping	Massimo Banzi	O'Reilly Media	-	-
14	RaspberryPiCookbok	SimonMonk	O'Reilly Media	-	-

Online Recourses:

S. No.	Website Name	URL	Modules covered
1.	https://www.nptel.ac.in	https://nptel.ac.in/courses/106105166/	M1,M2,M3, M4,M5,M6
2.	https://www.tutorialspoint.com	https://www.tutorialspoint.com/internet_of_things/internet_of_things_pdf	M1,M2,M3, M6
4	http://www.infocobuild.com	http://www.infocobuild.com/education/audio-video-	M5, M6
3.	http://www.listingtec.com	http://www.listingtec.com/nptel-iot-assignment-8-answers-introduction-to-internet-of-things/	M1,M4,M5, M6

T.E. Semester –VI
Choice Based Credit Grading Scheme with Holistic Student Development (CBCGS- H 2019)
TCET Autonomy Scheme (w.e.f. A.Y. 2020-21)

B.E. (Information Technology)							T.E. (SEM: VI)			
Course Name: Mobile Application Development							**Course Code: PEC- IT 6015**			
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**	**OR**	**TW**		
3	-	2@	5	4	25	75	25	25	**150**	
IA: In-Semester Assessment- Paper Duration – **1Hours**										
ESE: End Semester Examination- Paper Duration - **3 Hours**										
Total weightage of marks for continuous evaluation of Term work/Report: Formative (40%), Mini Project and presentation (40%) and Attendance /Learning Attitude (20%). @ Capstone Project										
Prerequisite: JAVA Programming, Internet Programming										

Course Objective: The course intends to deliver the fundamental knowledge of Android platform and its architecture, apply and create Android UI designing, broadcast receivers, Internet services, SQLite Database, integrate multimedia, camera, Location based services and know about Mobile security issues.

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	Describe Android platform, Architecture and features.	L1, L2, L3, L4
2	Design User Interface and develop activity for Android App.	L1, L2, L3, L4, L6
3	Use Intent, Broadcast receivers and Internet services in Android App.	L1, L2, L3, L4, L6
4	Design and implement Database Application and Content providers.	L1, L2, L3, L4, L6
5	Use multimedia, camera and Location based services in Android App.	L1, L2, L3, L4, L6
6	Discuss various security issues in Android platform	L1, L2, L3, L6

Detailed Syllabus:

Module No.	Topics	Hrs.	Cognitive levels of attainment as per Bloom's Taxonomy
1	**Introduction to Android and Architecture of Android** Introduction of Android platform, Android features, Android Marketplace, Evolution of Android OS, Android Application Architecture, Android Development Tools, First Android application, How to run and debug applications (Emulator vs. Real device), Android project structure, XML files, Enhancing the first app	07	L1, L2, L3, L4
2	**Applications, Activities and Building User Interface** Application: Application Manifest File, Externalizing Resources, Android Application Lifecycle and Android Application Class. User Interface: Fundamental Android UI Design, Layouts, Toast, Button, Toggle Button, Switch Button, Image Button, CheckBox, RadioBox, AlertDialog, Spinner, Auto Complete TextView, RatingBar, DatePicker, TimePicker, ProgressBar, File Download, Introduction to fragments Fragment, Fragment Example. Android Activity: Activity Lifecycle and Android Activity classes, Activity Example, Lifecycle, Creating new views, widget toolbox, Adapters(ArrayAdapters, BaseAdapters)	08	L1, L2, L3, L4, L6
3	**Intents, Broad Cast receiver and Internet Resources** Intents, Types of Intents (Implicit and Explicit), Linking Activities Using intents, Calling Built-in Applications Using intents, displaying notifications, Creating Intent Filters, Broadcast Receivers, Downloading and Parsing Internet Resources, Using the Download Manager, Internet Services, connecting to Google App Engine, Downloading Data Without Draining the Battery.	08	L1, L2, L3, L4, L6
4	**Data Persistence and Content Providers** Content Providers: Introducing Android Databases, Introducing SQLiteDatabse, DML & DDL Queries in brief, SQLiteOpenHelper, Cursor, SQLite Programming, Android Debug Bridge(adb) tool, Parsing an XML document, Parsing JSON data, Creating Content Providers, Using Content Providers. Adding Search to Your Application, Native Android Content Providers.	08	L1, L2, L3, L4, L6
5	**Audio, Video, Camera, Maps, Geocoding and Location Based Services** Playing Audio and Video, Manipulating Raw Audio, Using Audio, Using the Camera for Taking Pictures, Recording Video, Using Media Effects, Adding Media to the Media Store. Using Location-Based Services, Using the Emulator with Location-Based Services, selecting a Location Provider, Finding Your Current Location, Location Updates, Proximity Alerts, Geocoder, Map-Based Activities, Displaying Maps.	08	L1, L2, L3, L4, L6
6	**Securing and Publishing Android Application** Android Security Model, Android's Manifest Permissions, Mobile Security Issues, Recent Android Attacks, Pen Testing Android. Preparing for Publishing, Deploying APK Files.	06	L1, L2, L3, L6
	Total Hr.	45	

Capstone Project Guide Lines

1. The mini project work is to be conducted by a group of three students

2. Each group will be associated with a subject Incharge/ mini project mentor. The group should meet with the concerned faculty during Laboratory hours and the progress of work discussed must be documented.

3. The students may do survey for different application which they can create Apps using Android.

4. Students will do Installation, configuration of Android Studio & to create AVD and also try for Cross platform Integrated Development Environment (Any Open Source Tool).

5. Students will try to Design and implement following points in their Mini Project (Android Apps)
    a) Widget box for Android phone.
    b) Use Layouts
    c) Use Intents
    d) Use Activity
    e) Use SQLite
    f) Use Camera
    g) Use Location API
    h) Generate APK file

6. Each group along with the concerned faculty shall identify a potential problem statement for Apps development, on which the study and implementation is to be conducted.

7. Each group may present their work in various project competitions and paper presentations.

8. A detailed report is to be prepared as per guidelines given by the concerned faculty.

Capstone Project Hours Distribution:

Sr. No.	Work to be done	No. of Hours	Cognitive levels of attainment as per Bloom's Taxonomy
1	Study Research papers, articles, mini project title Identification	4	L1, L2
2	Project Title finalization and development of Modules	2	L1, L2
3	Design methodology and tools for implementation	4	L1, L2
4	Implementation of Modules phase 1	4	L1, L2, L3
5	Result Phase I	2	L1, L2, L3, L4
6	Implementation of Modules Phase 2	4	L1, L2, L3
7	Result Phase II	2	L1, L2, L3, L4
8	Testing	2	L1, L2, L3, L4
9	Result validation	2	L1, L2, L3, L4, L5
10	Report Writing	4	L1, L2
	Total Hours	30	

Books and References:

Sr. No	Title	Authors	Publisher	Edition	Year
1	Professional Android 4 Application Development	RETO MEIER	Wrox publication	3rd	2012
2	Android Security attack and defenses, by CRC Press	Abhishek Dubey, Anmol Misra	CRC Press	1st	2013
3	Beginning Android Application Development	Wei-meng Lee	Wrox publication	1st	2011
4	Android Application Development For Dummies	Michael Burton, DonnFelker	John Wiley & Sons	2nd	2012
5	Android Cookbook	Ian F. Darwin	O'Reilly Media	1st	2011

Online Recourses:

Sr. No.	Website Name	URL	Modules Covered
1.	https://developer.android.com www.tutlane.com www.tutorialspoint.com	https://developer.android.com/training/basics/firstapp https://www.tutlane.com/tutorial/android/android-introduction https://www.tutorialspoint.com/android/android_environment_setup.htm https://www.tutorialspoint.com/android/android_application_components.htm	M1
2.	www.tutlane.com www.tutorialspoint.com	https://www.tutlane.com/tutorial/android/android-ui-controls-textview-edittext-radio-button-checkbox https://www.tutorialspoint.com/android/android_acitivities.htm	M2
3.	www.udemy.com www.coursera.org/ www.tutlane.com www.tutorialspoint.com	https://www.udemy.com/learn-android-application-development-y/ https://www.coursera.org/specializations/android-app-development https://www.tutorialspoint.com/android/android_intents_filters.htm	M3
4.	www.tutlane.com www.tutorialspoint.com	https://www.tutlane.com/tutorial/android/android-content-providers-with-examples https://www.tutlane.com/tutorial/android/android-sqlite-database-with-examples https://www.tutorialspoint.com/android/android_json_parser.htm	M4
5.	www.tutlane.com www.tutorialspoint.com	https://www.tutlane.com/tutorial/android/android-google-maps-api-with-examples https://www.tutorialspoint.com/android/android_location_based_services.htm https://www.tutorialspoint.com/android/android_camera.htm https://www.tutlane.com/tutorial/android/android-audio-media-player-with-examples	M5
6.	www.tutlane.com www.tutorialspoint.com	https://www.tutlane.com/tutorial/android/android-test-app-on-real-device-mobile-phone https://www.tutlane.com/tutorial/android/android-publish-app-on-google-play-store	M6

T.E. Semester –VI
Choice Based Credit Grading Scheme with Holistic Student Development (CBCGS- H 2019)
TCET Autonomy Scheme (w.e.f. A.Y. 2020-21)

BE Information Technology							T.E (SEM : VI)			
Course Name: Digital Marketing							**Course Code:OEC -IT 6011**			
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**	
IA: In-Semester Assessment- Paper Duration – **1.5 Hours**										
ESE : End Semester Examination- Paper Duration - **3 Hours**										
Prerequisite: Marketing Fundamentals, Digital Assets, Digital System Setup and automation										

Course Objective: The course will transform you into a complete digital marketer with expertise in the top eight digital marketing domains — search engine optimization, social media, pay-per-click, conversion optimization, digital analytics, content, mobile, and email marketing. Fast-track your career in digital marketing today with practical training you can apply on the job.

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 Digital Business Models	L1,L2
2	Understand A.I. and machine learning terminologies, mind-set and its application in marketing	L1,L2
3	Build sophisticated machine learning models – learn how to gather and clean data, select an algorithm, train, evaluate and deploy a model	L1,L2
4	Predict churn, sales or score leads with tools	L1,L2,L5
5	Segment customers; build clustering models to drive personalization.	L1,L2,L5,L6
6	Build computer vision models for social visual listening, use natural language processing to predict consumption preferences.	L2,L5

Detailed Syllabus:

Module No.	Topics	Hrs.	Cognitive levels of attainment as per Bloom's Taxonomy
1	**Introduction - Digital Marketing** Digital Marketing Skills empowered by AI :SEO, Search Engine Marketing, Social Media Marketing, Web Analytics, Email Marketing, Content Marketing, Influencer Marketing, Conversion Rate Optimization, Tools Based Marketing, Lifecycle Marketing Automation.	7	L1,L2
2	**Full Funnel Marketing** **Acquisition:** Content marketing, landing page testing, campaign optimization, conversion rate optimization, lead scoring, competition and trend analysis, predict sales, optimize product pricing, programmatic media buying, segmentation and clustering for targeting, personalization. **Activation** Personalization, psychographic segmentation, behavioral segmentation **Retention** Predict churn, customer care chatbot, sentiment analysis, visual social listening, personalization **Revenue** Predict and maximize customer lifetime value, recommender systems, market basket analysis **Referral** Predict whether user recommend your product	8	L1,L2,L3
3	**Marketing framework and tools** **Planning:**Hubspot, Brightedge, Node, Crayon, Equals3, Marketmuse, Pathmatics, Calibermind, Alegion, Netra **Production** : Acrolinx, Narrative Science,Clarifai, GumGum, phrasee, curate Attentioninsight **Personalization** : Uberflip, Klevu, Seventh Sense, Blueshift, **Promotion** : Yext, Albert, Onespot, Cortex, Siftrock, inPowered, **Performance :**Monkeylearn, PaveAI,	8	L1,L2,L3,L5
4	**Predictive Analytics** Fundamentals of predictive analytics, Prediction model for lead scoring and sales forecasting, churn prediction model,Predictive modelling for customer behaviour, automated segmentation	7	L1,L2,L3,L5
5	**Psychographics, NLP and Computer Vision** Customer psychographics, leveraging personality traits to predict consumption preferences using NLP, Detect emotions, assign labels, understand text from images, detect news events, logos using Computer Vision	7	L1,L2,L3,L5
6	**Futuristic Marketing** IoTs Augmented Reality, Virtual Reality and XR for Marketing, Blockchain and smart contracts for marketing, NeuroMarketing, Wearable Tech, Personal Chatbots	8	L2,L3
	Total Hours	45	

Books and References:

Sr. No	Title	Authors	Publisher	Edition	Year
1	Artificial intelligence marketing and predicting consumer choice: an overview of tools and techniques	Struhl, S.	Kogan Page Publishers	Third	2017
2	AI for Marketing and Product Innovation: Powerful New Tools for Predicting Trends, Connecting with Customers, and Closing Sales.	Appel, A., Sthanunathan, S., Pradeep, A. K.	Wiley.	Third	2018
3	Artificial intelligence for marketing: practical applications	Sterne, J.	John Wiley & Sons	Fourth	2017..
4	Using Artificial Intelligence in Marketing: How to harness AI and maintain the competitive edge.	King, K.	Kogan Page Publishers	First	2019

Online References:

Sr. No.	Website Name	URL	Modules Covered
1	https://www.iimcal.ac.in/	https://iimcal.talentsprint.com/ai-powered-marketing/index.html?utm_source=googlesearch&utm_medium=cpc&utm_campaign=iimc-aipm-googlesearch-india&utm_content=ai-in-marketing-by-iimc&gclid=CjwKCAjwyo36BRAXEiwA24CwGVQrXnOTpcARRsFtvt8b9VAPqwV7KGPFmPyx36i1Zafl_7Br1OJEEhoChC4QAvD_BwE/	M1,M2,M3,M4,M5,M6
2	https://www.coursera.org/	https://www.coursera.org/learn/uva-darden-market-analytics	M4,M5,M6
3	https://academy.hubspot.com/	https://academy.hubspot.com/courses/artificial-intelligence-and-machine-learning-in-marketing?__hstc=89107140.de4401799f3edce1fd42a1704a37ab4a.1598174195879.1598174195879.1598174195879.1&__hssc=89107140.1.1598336323938&__hsfp=3825083997&hsCtaTracking=e4d097a0-ed0c-4f82-8e93-e9016ea31749%7C00439f3d-17bf-4431-af12-50a507004fcd	M1,M2,M3,M4,M5,M6

T.E. Semester-VI
Choice Based Credit Grading Scheme with Holistic Student Development (CBCGS- H 2019)
TCET Autonomy Scheme (w.e.f. A.Y. 2020-21)

B.E (Information Technology)							T.E.(SEM : VI)			
Course Name: Software Process Automation							**Course Code : OEC-IT 6012**			
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**
IA: In-Semester Assessment- Paper Duration – **1.5 Hours**										
ESE : End Semester Examination- Paper Duration - **3 Hours**										
Prerequisite: Object Oriented Programming, Frontend Backend connectivity										

Course Objective:
The objective of the course is to introduce to the students about the integration people involved in the software process with the development and tools required for automation of the project development.

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 importance of process automation and models of software process	L1, L2
2	Analyze the security and configuration management	L1, L2, L3,L4
3	Understand and apply the build concepts using a build tool	L1, L2, L3,L4
4	Understand the testing concepts and apply them to the project	L1, L2, L3,L4
5	Identify the activities in agile project management and use a tool for the same	L1, L2, L3,L4
6	Understand and identify the various principles of quality assurance	L1, L2, L3,L4

Detailed Syllabus:

Module No.	Topics	Hrs.	Cognitive levels of attainment as per Bloom's Taxonomy
1	**Introduction to process Automation** Importance of process automation, types of models, prescriptive and descriptive models, Devops model, process modelling objectives and goals	6	L1, L2
2	**Automation of config management** overview of configuration management, Github and git tool	8	L1, L2, L3,L4
3	**Build automation** Overview of build management, Jenkins tool for build management	4	L1, L2, L3,L4
4	**Test automation** Overview of testing concepts, test cases , selenium tool	8	L1, L2, L3,L4
5	**Project management** Project management concepts, agile team, Atlasian jira project management tool	8	L1, L2, L3,L4
6	**Quality management** Quality concepts and metrics, CMMI, ISO, spice, six sigma, Total Quality management	11	L1, L2, L3,L4
	Total Hours	**45**	

Books and References:

	Title	Authors	Publisher	Edition	Year
1	The DevOps handbook	Gene Kim, Jez Humble, Ptrik Debois & John Willis	IT revolution Press	first Edition	2016
2	Selenium WebDriver 3 Practical Guide: End-to-end Automation Testing for Web and Mobile Browsers with Selenium WebDriver	Satya Avasarala	Packt Publishing Ltd,	Second Edition	2018

Online Resources:

S. No.	Website Name	/URL	Modules Covered
1	www.researchgate.com	https://www.researchgate.net/publication/258865356_Software_Process_Definition_and_Management	M6

T.E. Semester –VI
Choice Based Credit Grading Scheme with Holistic Student Development (CBCGS- H 2019)
TCET Autonomy Scheme (w.e.f. A.Y. 2020-21)

B.E. (Information Technology)							T.E. SEM: VI		
Course Name :Entrepreneurship Development and Management							**Course Code : OEC IT-6013**		
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**
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: entrepreneurial mindset									

Course Objective: The course intends to inculcate entrepreneurial skills into the students and groom the aspiring learner to establish and successfully run an enterprise.

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	Recognize an overview of basic entrepreneurship concepts	L1, L2
2	Design a business plan and understand importance of capital	L1, L2, L3, L4, L5, L6
3	Discuss the rules and legislation w.r.t. entrepreneurship	L1, L2
4	Identify sources for organizational assistance in this field	L1, L2
5	Use knowledge gained for effective management of business	L1, L2, L3
6	Recognize ways of achieving success in business	L1, L2

Detailed Syllabus:

Module No.	Topics	Hrs.	Cognitive levels of attainment as per Bloom's Taxonomy
1	**Overview of Entrepreneurship**	5	L1, L2
	Definition, Importance, Roles and Functions, Evolution of term 'Entrepreneurship', Factors influencing Entrepreneurship, Characteristics of an Entrepreneur, of Types of Entrepreneur, Contribution of Government Agencies in Sourcing information for Entrepreneurship, Role of Entrepreneurship in the National Economy		
2	**Business Plans and importance of capital to Entrepreneurship**	10	L1, L2, L3, L4, L5, L6
	Preliminary and Marketing Plans, Management and Personnel, Start-up Costs and Financing as well as Projected Financial Statements, Legal Section, Insurance, Suppliers and Risks, Assumptions and Conclusion, Capital and its Importance to the Entrepreneur		
	Entrepreneurship And Business Development: Starting a New Business, Buying an Existing Business, New Product Development, Business Growth and the Entrepreneur Law and its Relevance to Business Operations		
3	**Rules and Legislation**	6	L1, L2
	Applicability of Legislation, Industries Development (Regulations) Act, 1951, Factories Act, 1948, The Industrial Employment (Standing Orders) Act, 1946, West Bengal Shops and Establishment Act, 1963, Environment (Protection) Act, 1986, The sale of Goods Act, 1950, Industrial Dispute Act 1947		
4	**Organization Assistance**	11	L1, L2
	Assistance to an entrepreneur, New Ventures, Industrial Park (Meaning, features, & examples), Special Economic Zone (Meaning, features & examples), Financial assistance by different agencies, MSME Act Small Scale Industries, Carry on Business (COB) license, Environmental Clearance, National Small Industries Corporation (NSIC), Government Stores Purchase scheme (e-tender process), Excise exemptions and concession, Exemption from income tax, Quality Standards with special reference to ISO, Financial assistance to MSME, Modernization assistance to small scale unit, The Small Industries Development Bank of India (SIDBI), The State Small Industries Development Corporation (SSIDC), Export oriented units, Shilpabandhu-M Incentives for entrepreneurs, Other agencies for industrial assistance, Directorate General of Supplies and Disposals(DGS & D), Khadi and Village Industries Commission (KVIC), Industrial Estate		
5	**Effective Management of Business**	8	L1, L2, L3
	Issues and problems faced by micro and small enterprises and effective management of M and S enterprises (risk management, credit availability, technology innovation, supply chain management, linkage with large industries), exercises, e-Marketing		
	Women Entrepreneurship Development, Social entrepreneurship-role and need, EDP cell, role of sustainability and sustainable development for SMEs, case studies, exercises		
6	**Achieving success in small business**	5	L1, L2
	Stages of the small business life cycle, four types of firm-level growth strategies, Options – harvesting or closing small business Critical Success factors of small business		
	Total Hours	**45**	

Books and Reference:

Sr	Title	Authors	Publisher	Edition	Year
1	Entrepreneurship Development and Management	Dr. A. K. Singh	Laxmi Pub. Ltd.	First	2009
2	Entrepreneur and Entrepreneurship	Mohd Asif Hasan			
3	Small Business and Entrepreneurship	S. Anil Kumar	I. K. International pvt. Ltd.	First	2008

Online Resources:

Sr	Website Name	URL	Modules Covered
1	www.nptel.ac.in	https://nptel.ac.in/courses/110/106/110106141/	M1-M6
2	www.coursera.org	https://www.coursera.org/specializations/wharton-entrepreneurship	M1-M6

T.E. Semester –VI
Choice Based Credit Grading Scheme with Holistic Student Development (CBCGS- H 2019)
TCET Autonomy Scheme (w.e.f. A.Y. 2020-21)

B.E. Course							T.E. Open Elective (SEM : VI)			
Course Name : Cyber Security and Laws							**Course Code : OEC- 6014**			
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**		
3	-	-	3	3	25	75	--	--	**100**	
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: Cryptography and Network Security										

Course Objective: The course intends to deliver the fundamental knowledge to understand concepts of cyber law, intellectual property, cybercrimes, trademarks, domain theft, tools used in cyber security and analyze security policies, protocols applied in Indian IT Act 2008, security standards compliances.

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 concept of cybercrime and its effect on outside world	L1
2	Interpret and apply IT law in various legal issues , Analyse security challenges and issues	L1, L2, L3, L4
3	Understand and analyse various attack using tools like wire shark , key logger etc.	L1
4	Distinguish different aspects of cyber law	L1, L2, L3, L4
5	Study India IT Act and analyse different case studies	L1, L2, L3, L4
6	Apply Information Security Standards compliance during software design and development	L1, L2, L3, L4

Detailed Syllabus:

Module No	Topics	Hrs	Cognitive levels of attainment as per Bloom's Taxonomy
1	**Introduction to Cybercrime** Introduction to Cybercrime: Cybercrime definition and origins of the world,Cybercrime and information security, Classifications of cybercrime, Cybercrime and the Indian ITA 2000, A global Perspective on cybercrimes	07	L1
2	**Symmetric and Asymmetric Cryptography** Introduction to symmetric cryptography, Substitution cipher, transposition cipher, stream and block cipher, and arithmetic modes for block ciphers, Introduction to asymmetric cryptography Primes, factorization, Fermat's little theorem, Euler's theorem, and extended Euclidean algorithm, RSA, attacks on RSA, Diffie Hellman key exchange , Message integrity, message authentication, MAC, hash function, H MAC	09	L1, L2, L3, L4
3	**Cyber offenses & Cybercrime** Cyber offenses & Cybercrime: How criminal plan the attacks, Social Engg, Cyber stalking, Cyber café and Cybercrimes, Bot nets, Attack vector, Cloud computing, Proliferation of Mobile and Wireless Devices, Trends in Mobility, Credit Card Frauds in Mobile and Wireless Computing Era, Security Challenges Posed by Mobile Devices, Registry Settings for Mobile Devices, Authentication Service Security, Attacks on Mobile/Cell Phones, Mobile Devices: Security Implications for Organizations, Organizational Measures for Handling Mobile, Devices-Related Security Issues, Organizational Security Policies and Measures in Mobile Computing Era, Laptops	10	L1
4	**Tools and Methods Used in Cyber line** Phishing, Password Cracking, Key loggers and Spywares, Virus and Worms, Steganography, DoS and DDoS Attacks, SQL Injection, Buffer Over Flow, Attacks on Wireless Networks, Phishing, Identity Theft (ID Theft)	08	L1, L2, L3, L4
5	**The Concept of Cyberspace** E-Commerce, The Contract Aspects in Cyber Law ,The Security Aspect of Cyber Law ,The Intellectual Property Aspect in Cyber Law , The Evidence Aspect in Cyber Law , The Criminal Aspect in Cyber Law, Global Trends in Cyber Law , Legal Framework for Electronic Data Interchange Law Relating to Electronic Banking , The Need for an Indian Cyber Law	09	L1, L2, L3, L4
6	**Indian IT Act.** Cyber Crime and Criminal Justice: Penalties, Adjudication and Appeals Under the IT Act, 2000, IT Act. 2008 and its Amendments	07	L1, L2, L3, L4
	Total Hours	45	

Books and References:

Sr. No	Title	Authors	Publisher	Edition	Year
1	Cyber Security	Nina Godbole, Sunit Belapure	Wiley India ,New Delhi	2nd	2011
2	The Indian Cyber Law	Suresh T. Vishwanathan	Bharat Law House,New Delhi	2nd	2015
3	Cyber Law & Cyber Crimes	Advocate Prashant Mali	Snow White Publications, Mumbai	2nd	2015
4	Information Systems Security	Nina Godbole	Wiley India, New Delhi	2nd	2014
5	Cyber Security & Global Information Assurance	Kennetch J. Knapp	Information Science Publishing.	1st	2009

Online Resource

S.No.	Website Name	URL	Modules covered
1.	http://www.cyberralegalservices.com	http://www.cyberralegalservices.com/detail-casestudies.php	M1
2.	https://www.tutorialspoint.com	https://www.tutorialspoint.com/information_security_cyber_law/offences_and_penalties	M2
3.	https://www.educba.com	https://www.educba.com/32-most-important-cyber-security-tools/	M3
4.	https://www.itu.int	https://www.itu.int/en/ITU-D/Cybersecurity/Documents/Introduction%20to%20the%20Concept%20of%20IT%20Security.pdf	M4
5.	https://www.tutorialspoint.com	https://www.tutorialspoint.com/information_security_cyber_law/information_technology_act.htm	M5
6.	https://www.cimcor.com	https://www.cimcor.com	M6

TCET

DEPARTMENT OF INFORMATION TECHNOLOGY (IT)
[Accredited by NBA for 3 years, 3rd Cycle Accreditation w.e.f. 1st July 2019]
Choice Based Credit Grading System with Holistic Student Development (CBCGS- H 2019)
Under TCET-Autonomy Scheme - 2019

T. E. Sem –VI

Choice Based Credit Grading Scheme with Holistic Student Development (CBCGS- H 2019)

TCET Autonomy Scheme (w.e.f. A.Y. 2020-21)

B.E. Course							T.E. Open Elective SEM:VI				
Course Name: Reliability Engineering							**Course Code**: OEC- 6015				
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**	
03	-	-	3	3	25	75	-	-	-	-	
IA : Internal 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: Signals and Systems, Control systems											

Course Objective: To impart various aspects of probability theory, system reliability, and maintainability, availability and FMEA procedure.

Course Outcomes: Students will be able to:

SN	Course Outcomes	Cognitive Levels as per Bloom's Taxonomy
1	Understand and apply the concept of Probability to engineering problems	L1,L2,L3
2	Apply various reliability concepts to calculate different reliability parameters	L1,L2,L3,L4
3	3Estimate the system reliability of simple and complex systems	L1,L2,L3
4	. Carry out a Failure Mode Effect and Criticality Analysis	L1,L2,L3,L4

Detailed Syllabus:

Module No.	Topics	Hrs	Cognitive Levels as per Bloom's Taxonomy
1	**Probability theory** Probability: Standard definitions and concepts; Conditional Probability, Baye's Theorem. Probability Distributions: Central tendency and Dispersion; Binomial, Normal, Poisson, Weibull, Exponential, relations between them and their significance. Measures of Dispersion: Mean, Median, Mode, Range, Mean Deviation, Standard Deviation, Variance, Skewness and Kurtosis.	09	L1,L2,L3
2	**Reliability Concepts** Reliability Concepts: Reliability definitions, Importance of Reliability, Quality Assurance and Reliability, Bath Tub Curve. Failure Data Analysis: Hazard rate, failure density, Failure Rate, Mean Time ToFailure (MTTF), MTBF, Reliability Functions. Reliability Hazard Models: Constant Failure Rate, Linearly increasing, TimeDependent Failure Rate, Weibull Model. Distribution functions and reliability analysis.	09	L1,L2,L3,L4
3	**System Reliability:** System Reliability: System Configurations: Series, parallel, mixed configuration, k out of n structure, Complex systems	07	L1,L2,L3
4	**Reliability Improvement:** Reliability Improvement: Redundancy Techniques: Element redundancy, Unit redundancy, Standby redundancies. Markov analysis. System Reliability Analysis – Enumeration method, Cut-set method, Success, Path method, Decomposition method.	08	L1,L2
5	**Maintainability and Availability** Maintainability and Availability: System downtime, Design for Maintainability: Maintenance requirements, Design methods: Fault Isolation and self-diagnostics, Parts standardization and Interchangeability, Modularization and Accessibility, Repair Vs Replacement. Availability – qualitative aspects.	06	L1,L2,L3,L4
6	**Failure Mode, Effects and Criticality Analysis** Failure mode effects analysis: severity/criticality analysis, FMECA examples. Fault tree construction, basic symbols, development of functional reliability block diagram, Fau1t tree analysis and Event tree Analysis	06	L1,L2,L3,L4
	Total Hours:	45	

Books and References:

S. No	Title	Authors	Publisher	Edition	Year
1	Reliability Engineering",	L.S. Srinath,	"Affiliated East-Wast Press (P) Ltd	3rd Edition	1985
2	"Reliability and Maintainability Engineering	Charles E. Ebeling	Tata McGraw Hill.	4th Edition	2015
3	Engineering Reliability	B. S. Dhillion C. Singh,	John Wiley & Sons	5th edition	1980
4	Practical Reliability Engg.",	P.D.T. Conor	John Wiley & Sons	3rd Edition	1985.
5.	Reliability in Engineering Design	K.C. Kapur, L.R. Lamberson	John Wiley & Sons.	3rd Edition	1989
6.	Probability and Statistics	Murray R. Spiegel	Tata McGraw-Hill Publishing Co. Ltd.	5th edition	1980

T.E. SEM VI
Choice Based Credit Grading Scheme with Holistic Student Development (CBCGS- H 2019)
TCET Autonomy Scheme (w.e.f. A.Y. 2020-21)

B.E. Course					T.E. Open Elective SEM: VI				
Course Name: Product Life Cycle Management					**Course Code:** OEC- 6016				
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	
3	-	-	3	3	25	75	-	-	**100**
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: Product Design and Development, Quality and Reliability Engineering									

Course Objectives:

Course intend to provide an exposure to new product development program and guidelines for designing and developing a product and apply the knowledge of Product Data Management & PLM strategies.

Course Outcomes:

SN	Course Outcomes	Cognitive levels as per bloom's Taxonomy
1	Illustrate knowledge about phases of PLM, PLM strategies and methodology for PLM feasibility study and PDM implementation	L1, L2
2	Illustrate various approaches and techniques for designing and developing products.	L1
3	Apply product engineering guidelines / thumb rules in designing products for moulding, machining, sheet metal working etc	L1, L2, L3, L4
4	Acquire knowledge in applying virtual product development tools for components, machining and manufacturing plant	L1, L2, L3, L4
5	Apply Integration of Environmental Aspects in Product Design	L1, L2, L3, L4
6.	Illustrate knowledge about Life Cycle Assessment and Life Cycle Cost Analysis	L1, L2

Detailed Syllabus:

Module No.	Topics	Hrs.	Cognitive levels as per bloom's Taxonomy
1	**Introduction to Product Lifecycle Management (PLM) and PLM Strategies** Product Lifecycle Management (PLM), Need for PLM, Product Lifecycle Phases, Opportunities of Globalization, Pre-PLM Environment, PLM Paradigm, Importance & Benefits of PLM, Widespread Impact of PLM, Focus and Application, A PLM Project, Starting the PLM Initiative, PLM Applications Industrial strategies, Strategy elements, its identification, selection and implementation, Developing PLM Vision and PLM Strategy , Change management for PLM	11	L1, L2
2	**Product Design** Product Design: Product Design and Development Process, Engineering Design, Organization and Decomposition in Product Design, Typologies of Design Process Models, Reference Model, Product Design in the Context of the Product Development Process, Relation with the Development Process Planning Phase, Relation with the Post design Planning Phase, Methodological Evolution in Product Design, Concurrent Engineering, Characteristic Features of Concurrent Engineering, Concurrent Engineering and Life Cycle Approach, New Product Development (NPD) and Strategies, Product Configuration and Variant Management, The Design for X System, Objective Properties and Design for X Tools, Choice of Design for X Tools and Their Use in the Design Process	10	L1
3	**Product Data Management (PDM)** Product Data Management (PDM):Product and Product Data, PDM systems and importance, Components of PDM, Reason for implementing a PDM system, financial justification of PDM, barriers to PDM implementation	6	L1, L2, L3, L4
4	**Virtual Product Development Tools** Virtual Product Development Tools: For components, machines, and manufacturing plants, 3D CAD systems and realistic rendering techniques, Digital mock-up, Model building, Model analysis, Modeling and simulations in Product Design, Examples/Case studies	6	L1, L2, L3, L4
	Integration of Environmental Aspects in Product Design		

5	Integration of Environmental Aspects in Product Design: Sustainable Development, Design for Environment, Need for Life Cycle Environmental Strategies, Useful Life Extension Strategies, End-of-Life Strategies, Introduction of Environmental Strategies into the Design Process, Life Cycle Environmental Strategies and Considerations for Product Design	6	L1, L2, L3, L4
6	**Life Cycle Assessment and Life Cycle Cost Analysis**		
	Life Cycle Assessment and Life Cycle Cost Analysis: Properties, and Framework of Life Cycle Assessment, Phases of LCA in ISO Standards, Fields of Application and Limitations of Life Cycle Assessment, Cost Analysis and the Life Cycle Approach, General Framework for LCCA, Evolution of Models for Product Life Cycle Cost Analysis. Introduction to Industry4.0, Design principles and Challenges, Applications of Industry 4.0	6	L1, L2
	Total Hours:	**45**	

Books and References:

SN	Title	Authors	Publisher	Edition	Year
1	Product Lifecycle Management: Paradigm for 21st Century Product Realisation	John Stark	Springer-Verlag	1st Edition	2004

TCET

DEPARTMENT OF INFORMATION TECHNOLOGY (IT)
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Choice Based Credit Grading System with Holistic Student Development [CBCGS - H 2019]
Under TCET-Autonomy Scheme - 2019

T.E. Semester –VI
Choice Based Credit Grading Scheme with Holistic Student Development (CBCGS- H 2019)
TCET Autonomy Scheme (w.e.f. A.Y. 2020-21)

BE (Information Technology)							T.E. (SEM : V)			
Course Name :Essence of Indian Knowledge Tradition							**Course Code : MC-IT 601**			
Teaching Scheme (Program Specific)						**Examination Scheme (Formative/ Summative)**				
Modes of Teaching / Learning / Weightage						**Modes of Continuous Assessment / Evaluation**				
Hours Per Week						**Theory (100)**		**Presentation (25)**	**Report (25)**	**Total**
Theory	**Tutorial**	**Practical**	**Contact Hours**	**Credits**		**IA**	**ESE**	**AC**	**AC**	
1	--	--	1	Non credit		--	--	--	25	**25**
AC- Activity Evaluation										
Total weightage of marks for continuous evaluation of Term work/Report: Formative (40%), Timely Completion of Practical (40%) and Attendance/ Learning Attitude (20%)										
Prerequisite: History, Value Education, Moral Science										

Course Objective: The course aims at imparting basic principles of thought process, reasoning and inferencing with focus on sustainability as the core of Indian Traditional knowledge Systems connecting society and nature. It also focuses on Holistic life style of yogic science and wisdom important in modern society with rapid technological advancements and societal disruptions with an introduction to Indian Knowledge Systems, Indian philosophical traditions, Indian perspective of modern scientific world-view, and basic principles of Yoga and holistic health care system..

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	Develop knowledge of trade and commerce in classical and medieval India.	L1, L2
2	Correlate and develop the understanding of Indian Knowledge System with modern Science.	L1, L2, L3
3	Develop the knowledge of Ancient Indian science and technology and India's contribution to the world.	L1, L2,L3
4	Know and analyse the effects of colonization on Indian culture and civilization.	L1, L2, L3,L4
5	Understand the role and position of women in traditional and modern Indian society	L1, L2
6	Develop the knowledge of Globalization and growth of India Economy since Independence.	L1, L2, L3, L4

Detailed Syllabus:

Module No.	Topics	Hrs.	Cognitive levels of attainment as per Bloom's Taxonomy
1	**Introduction**		L1, L2
	Ancient India –– Classical India – Dharma as the bedrock of Indian society – Trade and commerce in classical and medieval India and the story of Indian supremacy in the Indian ocean region;	2	
2	**Basic structure of Indian Knowledge System**		L1, L2,L3
	The vedas, the vedic society and the Sanatana Dharma, classical sanskrit literature – Modern Science and Indian Knowledge System - Yoga and Holistic Health care Indian Philosophy – the orthodox (Vaidika) and the heterodox (atheistic) schools; Ramayana and Mahabharata; Bhagavad Gita;	3	
3	**India's contribution to the world: spirituality, philosophy and sciences**		L1, L2, L3
	Saints and sages of India; Ancient Indian medicine: towards an unbiased perspective; Ancient Indian mathematics; Ancient Indian astronomy; Ancient Indian science and technology.	2	
4	**Indian economy – before and after colonization:**		L1, L2, L3,L4
	What attracted the rest of the world to India?; India on the eve of the arrival of European merchants; The story of colonization and the havoc it wrecked on Indian culture and civilization; Macaulay and the start of the distortion of Indian education and history; a brief survey; The emergence of modern India.	3	
5	**Women in Indian society**		L1, L2
	The role and position of women in Hindu civilization; Gleanings from the Vedas, Brihadarnyaka Upanishad, Saptasati Devi Mahatmyam, Ramayana, Mahabharata, Manusmriti, Kautilya'sArthasastra and Mrichchhakatikam of Sudraka; The role and position of Indian women.	3	
6	**Modern India**		L1, L2
	The national movement for freedom and social emancipation; Swami Vivekananda, Sri Aurobindo, Rabindranath Tagore; Understanding Mahatma Gandhi; A new nation is born as a republic – the pangs of birth and growth; India since Independence – the saga of socio-political movements; Problems facing the nation today; Globalization and Indian Economy; Bharatavarsha today and the way ahead: Regeneration of Indian National Resources.	2	
	Total Hrs.	**15**	

Books and References:

Sr .No.	Title	Authors	Publisher	Edition	Year
1.	Cultural Heritage of India-course material	V. Sivaramakrishnan	BharatiyaVidyaBhavan ,	5th Edition,	2014
2.	Glimpses of Traditional Indian Life	Bhakti Vikas Swami	Bhakti Vikas Trust	2014	2010
3.	Knowledge traditions and practices of India	CBSE Publication	CBSE Publication		
4.	Value Education for Young Leaders	Dr. P Hari Krishna	Vashnavi Krishna Publication	2ⁿᵈ Edition	2015
5.	Open eye Meditation	Shubha Vilas Das	FinGer Print Belief	2ⁿᵈ Edition	2016
6.	Life Amazing Secrets	Gaur Gopal Das	Penguin India	1ˢᵗ Edition	2018
7.	Ethics from Epics	Govinda Das	Tulsi Publication	1ˢᵗ Edition	2015
8.	A Hand Book on PANCH KOSH	Rajesh A Kadam	Shishmahal Arts Co	1st Edition	2019

Online References:

Sr. No.	Website Name	URL	Modules Covered
1	Glimpses of Eternal India	https://www.amrita.edu/course/glimpses-eternal-india	M1- M6

Semester –VI
Choice Based Credit Grading Scheme with Holistic Student Development (CBCGS- H 2019)
TCET Autonomy Scheme (w.e.f. A.Y. 2020-21)

B.E. (Information Technology)					T.E. SEM: VI		
Course Name: Summer Internship					**Course Code:** SI-IT601		
Teaching scheme (Contact Hrs. during Semester Break/ End of Semester(Between 21st and 25th Week)					**Assessment/Evaluation Scheme**		
					Presentation	**Report**	Non -Grant Term work based on the presentation and Report
Theory	**AC**	**Practical**	**Contact Hours**	**Credits**	**AC**	**AC**	
-	-	-	160 *	4 *	-	-	50
AC- Activity evaluation TW – Term Work Examination **Total weightage of marks for continuous evaluation of Term work/Report:** Formative (40%), Timely Completion of Practical (40%) and Attendance/Learning Attitude (20%).							
Prerequisite: Fundamental knowledge of Information Technology related tools							
* Students may go upto 160 hrs. to aquire maximum 4 credits. Students should collectively acquire total contact hrs in above activities in a span of 1 year (5th and 6th Semester). Student will submit a report to earn Termwork marks in internship at the end of 6th Semester. Following activities should be considered for Summer Internship:- 1)Participipation in inhouse internship at the end of 5th and 6th semester of 2 week each. 2)Other activity which also will be considered are: Participation in Hackathon, Development of new Product/ Business Plan / Registration of start-up, Participation in IPR workshop/Leadership talks/Idea/ Design / Innovation/Technical Expos, Internship with Industry / Govt. / NGO/ PSU/MSME/Online Internship, Long Term Goals under Rural Internship.							

Course Objectives:

To get industry like exposure in the college laboratories by carrying out projects using subject studied till 6th semester. Also design innovative techniques / methods to develop the products.
To gain knowledge of marketing and publicizing products developed.

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	To apply subjects knowledge in the college laboratories for carrying out projects	L1, L2,L3
2	Able to developed innovative techniques / methods to develop the products	L1, L2,L3
3	Able to do marketing and publicity of products developed	L1, L2,L3

TCET

DEPARTMENT OF INFORMATION TECHNOLOGY (IT)

[Accredited by NBA for 3 years, 3rd Cycle Accreditation w.e.f. 1st July 2019]
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Under TCET-Autonomy Scheme - 2019

Detailed Syllabus:

Module No.	Topics	Cognitive levels of attainment as per Bloom's Taxonomy
1	**Program Specific Internship** Training and certification on emerging technologies in domains offered by Department of Computer Engineering Applying classroom and laboratory knowledge to design , develop and deploy the products	L1, L2, L3
2	**Inter disciplinary Internship** • To explore and understand issues and challenges in the other disciplines (EXTC, ELEX, MECH and CIVIL) • Design , develop and deploy cost effective products using multidisciplinary approach	L1, L2, L3
3	**Industry Specific Internship** • To explore and understand issues and challenges in industry • Developing solutions for industry specific problems • Design , develop and deploy products for startup and SMEs	L1, L2, L3
4	**Interpersonal Internship** • To develop interpersonal skills such as leadership, marketing ,publicity and corporate ethics and communication • To get competence in problem solving , presentation , negotiation skills	L1, L2, L3
5	**Social Internship** • Identify and study different real life issues in the society • Identify societal problems and provide engineering solutions to solve these problems	L1, L2, L3
6	**Academic Internship** • Study report preparation, preparation of presentations, copy table book preparation , business proposal and IPR • Capture aspirations & expectations through interviews of students. • Ways to connect research in technical institutes with industry. • Taking inputs from self, local stakeholders and global stake holders which will help to develop process with comparative and competitive study.	L1, L2, L3

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	https://www.letsintern.com/	https://www.letsintern.com/internships/summer-internships	M1-M6
2	https://codegnan.com	https://codegnan.com/blog/benefits-of-internships-and-importance	M1-M6
3	https://www.honorsociety.org	https://www.honorsociety.org/articles?category=internships	M1-M6

Semester –VI

Choice Based Credit Grading Scheme with Holistic Student Development (CBCGS- H 2019)
TCET Autonomy Scheme (w.e.f. A.Y. 2020-21)

B. E. Information Technology					SEM: VI		
Course Name: Employability Skill Development Programme-III (Futuristic Web Development)					**Course Code: ESD-IT 601**		
Teaching Scheme (Program Specific)					**Examination Scheme (Formative/ Summative)**		
Modes of Teaching / Learning / Weightage					**Modes of Continuous Assessment / Evaluation**		
Hours					**Presentation**	**Report**	**Total**
Theory	**Tutorial**	**Practical**	**Contact Hours**	**Credits**	**AC**	**AC**	
-	-	30	30	1	Based on Parameters Decided by Training and Placement Cell		**50**
AC : Activity **The weightage of marks for continuous evaluation of Term work:** Formative (60%) and Attendance / Learning Attitude (40%) **Presentation/Report:** Knowledge (50%), Skills (30%) and Competency (20%)							
Prerequisite: Computer Basics, Procedural Programming Languages RBT: Revised Bloom's Taxonomy							

Course Objective: The course intends to make students learn various web development concepts. The main purpose of the course is to develop professional skills required for Full Stack Developer so as to meet industry expectations.

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 JavaScript.	L1, L2
2	Describe various structured data representation techniques like JSON, AJAX.	L1, L2, L3
3	Implement dynamic web pages using structural frameworks like Angular.Js and React.Js	L1, L2, L3,L4
4	Understand the concept of progressive web apps.	L1, L2,L3,L4,L5
5	Apply knowledge of NoSQL databases and data modeling concepts.	L1, L2, L3,L4,L5
6	Understand the concepts of web socket programming.	L1, L2, L3, L4,L5

Detailed Syllabus:

Module No.	Topic	Total Hours	Cognitive levels of attainment as per Bloom's Taxonomy
1	**Overview of JavaScript**	02	L1, L2
	Introduction to JavaScript: Advantages of using Java Script on client side over VBScript, Variables in Java Script,Statements,Operators,Comments,Constructs,Functions,Expressions,JavaScript console, Scope, Events, Strings, String Methods, Numbers, Number Methods, **Control Structures:** Functions, Objects, Object Definitions, Object Properties, Object Methods, Object Prototypes, Object Oriented Programming: Method, Constructor, Inheritance, Encapsulation, Abstraction.		
2	**JavaScript Frameworks**	06	L1, L2 ,L3
	JSON: Introduction to the JavaScript Object Notation (JSON), JSON vs XML, Need of JSON, JSON Syntax Rules, JSON Data, JSON Objects, JSON Arrays, JSON Uses, JSON Files, AJAX, Rich Internet Application using AJAX and JSON. **Node.js:** Introduction to Node.js, Node modules, Selectors Syntax, Developing node.js web application, Event-driven I/O server-side JavaScript.		
3	**Angular.Js**	04	L1, L2 ,L3,L4
	Angular.js: Introduction, Angular 2 Architecture, Language Choices, Introduction to Components, Templates, Interpolation, and Directives, Data Bindings and Pipes, Building Nested Components Services and Dependency Injection, Retrieving Data Using HTTP, Navigation and Routing Basics, Angular Modules .Single Page Web Application using AngularJS.		
4	**Introduction to Progressive Web Apps**		
	Introduction to Progressive Web Apps: Concept of Progressive Web App and its need. Progressive Web Apps core building blocks, PWA vs Native Mobile Apps. **Service Workers:** How applications work offline using Service Workers. **Web App Manifest:** Installation of your Progressive Web App to device's home screen by properly configuring a Web App Manifest.		L1, L2 ,L3,L4,L5
5	**Introduction to MongoDB**		
	What Is MongoDB? Installation and Configuration , CRUD operations, MongoDB API Creating a Database, Collection and Documents **Data Modelling & Schema :** MongoDB Database References ,Model Tree Structures , MongoDB Analyzing Queries, MongoDB Atomic Operations , MongoDB Text Search, MongoDB Regular Expression, MongoDB Capped Collections **Deployment:** MongoDB Deployment and Cluster setup MongoDB GridFS Trident Spout	04	L1, L2 ,L3,L4,L5
6	**Web Socket Programming**		
	WebSockets Introduction- Overview , Duplex Communication , Functionalities, Implementation. WebSockets Roles - Events and Actions, Opening Connections, Handling Errors , ,Send & Receive Msgs, Closing a Connection. JavaScript & WebSockets API - Server Working, API , JavaScript Application. WebSockets Implementation - Communicating with Server, WebSockets – Security	02	L1, L2 ,L3,L4,L5
		20	

Books and References:

SN	Title	Authors	Publisher	Edition	Year
1.	Advance Internet Technology	Dr. Deven Shah	Dreamtech Publication	-	2014
2.	JavaScript Step by Step	Steve Suehring	Microsoft Press US		2011
3.	Rich Internet Application AJAX and Beyond	Dana Moore, Raymond Budd, Edward Benson	WROX press	-	2007
4.	Node.js, MongoDB and AngularJS Web Development	Brad Dayley	Addison Wesley	-	2014
5.	Building Progressive Web Apps: Bringing the Power of Native to the Browser	Tal Ater	O'Reilly Media	1st Edition	2017

Online References:

Sr. No.	Website Name	URL	Modules Covered
1	www.w3schools.com	https://www.w3schools.com/js/js_json.asp	M1, M2
2	www.tutorialspoint.com	https://www.tutorialspoint.com	M2, M3
3	www.dzone.com	https://dzone.com/articles/how-to-build-a-progressive-web-app-pwa-with-javasc	M4
4	www.tutorialspoint.com	https://www.tutorialspoint.com/mongodb/index.htm	M5
5	www.tutorialspoint.com	https://www.tutorialspoint.com/software_testing_dictionary/web_application_testing.html	M6

T.E. Semester –VI

Choice Based Credit Grading Scheme with Holistic Student Development (CBCGS- H 2019)
TCET Autonomy Scheme (w.e.f. A.Y. 2020-21)

B.E. (Information Technology)					T.E. SEM:VI		
Course Name: Professional Skills VI(Cloud Technology -AWS)					**Course Code: HSD IT PS 601**		
Teaching scheme (Holistic Student Development - HSD) (Conducted in the beginning of Semester during first 3 Weeks					**Examination Scheme(Formative/Summative)**		
Modes of Teaching/Learning/Weightage					**Modes of continuous Assessment/Evaluation**		
Hours					**Presentation**	**Report**	**Total**
Theory	**Tutorial**	**Practical**	**Contact Hours**	**Credits**	**AC**	**AC**	**TW**
15	-	30	45	2	50	25	75

AC- Activity evaluation TW – Term Work Examination

Weightage of Marks for continuous evaluation of Termwork /Report : Formative(40%)Timely completion of practical(40%),Attendance Learning Attitude (20%)

Prerequisite: Internet Programming,Knowledge of any programming language

Course Objective: The course intends to deliver the fundamentals of cloud computing and Amazon Web Services with the knowledge of virtualization, Lambda function, creating different applications using DynamoDB, interactive serverless web applications and functions .

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	Discuss the fundamentals of cloud computing and and various services of AWS .	L1, L2, L3 L4
2	Explain and Create an EC2 instance and EBS volume types and create an EC2 Instance.	L1, L2, L3 L4
3	Understand the usage of EBS persistent storage and Amazon storage services S3	L1, L2, L3 L4
3	To write functions with the AWS Lambda Service that respond to events and integrate other AWS Services	L1, L2, L3 L4
4	To design, build, and deploy interactive serverless web applications using Amazon API Gateway to query Amazon DynamoDB data	L1, L2, L3 L4
5	To build and run applications and services and analyze the performance	L1, L2, L3 L4,L5

Detailed Syllabus:

Module No.	Topics	Hrs.	Cognitive levels of attainment as per Bloom's Taxonomy
1	**Virtualization & cloud computing**		
	What is Cloud Computing,cloud computing service and Deployment Models, Need of Virtualization and cloud computing,Why AWS, Various cloud computing products offered by AWS	2	L1, L2, L3 ,L4
2	**Elastic Compute cloud**		
	Elastic Compute Cloud(EC2): Compute Basics, Instance types, EC2 instance types & Pricing Models, , Launching an AWS EC2 instance, Introduction to Elastic Block Store - EBS , EBS Snapshots , EBS Volume Types Instance Store Volumes,	3	L1, L2, L3 ,L4
3	**Elastic Load Balancer & Storage Service**	2	
	Introduction to Elastic Load Balancer ,Types of ELB ,autoscaling, Introduction to Simple Storage Service (S3) , Features of S3		L1, L2, L3 ,L4
4	**Serverless Computing with AWS Lambda**		
	What is serverless computing, need of Aws Lambda , working with AWS Lambda, Create API Gateway ,Building our API ,Link Lambda Function to API Gateway, Passing data to API gateway,Amazon Lex	3	L1, L2, L3 ,L4
5	**Amazon DynamoDB**	3	
	Introduction to Amazon DynamoDB, Features of DynamoDB,DynamoDB API,Creating and querying DynamoDB, Serverless Web Apps using Amazon DynamoDB .		L1, L2, ,L3,L4
6	**Access Management & Monitoring**	2	L1, L2, L3.L4 ,L5
	Understanding the IAM Policies, IAM User, IAM Policy and IAM Role, Introduction to CloudWatch, Auditing AWS environment with CloudTrail		
	Total Hours	15	

Practical Details:

Prac tical No.	Type of experiment	Practical/Experiment topic	Hrs	Cognitive levels of attainment as per Bloom's Taxonomy
1	Basic Experiment	Launch an EC2 Instance.	2	L1, L, L3,L4
2		Launch EC2 Instance with multiple EBS Volumes Attached	2	L1, L2, L3,L5
3	Design Experiment	Create an AWS Lambda Function	2	L1, L2, L3,L4
4		Create DynamoDb table and working with Queries	2	L1, L2, L3,L4
5		Create AWS Lambda and API gateway to POST form data and insert in DynamoDb table	2	L1, L2, L3,L4
6		Serverless Web Apps using Amazon DynamoDB	4	L1, L2, L3,L4
7	Advance Experiment	Creating a Simple Bot with Lex	2	L1, L2, L3,L4
8		Serverless Architectures using Amazon CloudWatch Events and Scheduled Events with AWS Lambda	4	L1, L2, L3,L4
9		Using AWS Lambda with Amazon CloudWatch and SNS to Implement a Slack Chat Bot	4	L1, L2, L3,L4
10	Miniproject	Miniproject	6	L1, L2, L3,L4,L5,L6
		Total	**30**	

Books and References:

Sr. No	Title	Authors	Publisher	Edition	Year
1	Learning Amazon Web Services (AWS): A Hands-On Guide to the Fundamentals of AWS Cloud	Mark Wilkins	Addison-Wesley Professional	1 st Edition	2019
2	Learning AWS	Aurobindo Sarkar, Amit Shah	Packt Publishing Ltd	1 st Edition	2015
3	Aws: 2019 Amazon Web Services Beginners User Guide. The Ultimate Tutorial	Julian Hun	Independently Published	1 st Edition	2019

Online References:

Sr. No.	Website Name	URL
1	https://aws.amazon.com/	https://amazon.qwiklabs.com/catalog?keywords=introduction%20to%20aws%20lambda&ransack=true
2	https://docs.aws.amazon.co/	https://docs.aws.amazon.com/dynamodb/?id=docs_gateway
3	ttps://www.edureka.co/	https://www.edureka.co/blog/amazon-dynamodb-tutorial
4	https://docs.aws.amazon.com/	https://docs.aws.amazon.com/

T.E. Semester –VI
Choice Based Credit Grading Scheme with Holistic Student Development (CBCGS- H 2019)
TCET Autonomy Scheme (w.e.f. A.Y. 2020-21)

B.E (Information Technology)							T.E(SEM : VI)			
Course Name : Project Based Learning-IV							**Course Code : HSD-ITPBL601**			
Teaching scheme (Holistic Student Development - HSD) (Conducted in the beginning of Semester during first 3 Weeks						**Examination Scheme (Formative/ Summative)**				
Modes of Teaching / Learning / Weightage						**Modes of Continuous Assessment / Evaluation**				
Hours						**Theory (100)**		**Presentation (25)**	**Report (25)**	**Total**
Theory	**Tutorial**	**Practical**	**Contact Hours**	**Credits**	**IA**	**ESE**	**AC**	**AC**	**TW**
-	-	30	30	1	-	-	25	--	**25**
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 Fundamentals & knowledge of Programming Languages										

Course Objectives: The course intends to deliver the fundamental knowledge of basic real time problems, study existing solutions, prepare literature survey, and apply basic computing & mathematics fundamentals and fundamental concepts of Programming such as C/C++ and Java to solve Basic real time problems.

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	To identify & analyze the basic real time problems and prepare literature survey.	L1, L2, L3,L4
2	Identify & apply appropriate technologies & programming constructs to solve problems.	L1, L2, L3
3	Presenting & Documenting results obtained.	L1, L2, L3,L4

Suggested Project Listing:

Sr. No.	Project Title
1.	Separate banking software for persons with intellectual disabilities including the better access to avail the benefits of ATM services
2.	IOT in agriculture
3.	Games on Road Safety
4.	Google Ad Grants online marketing challenge
5.	IoT in healthcare
6.	Google Ad Grants online marketing challenge
7.	Design an intelligent algorithm leveraging big data/AI/machine learning techniques that can learn from user viewing behavior
8.	End to end mapping of network to arrive at the expected time of delivery
9.	Image analysis and compression
10.	Knowledge Enhancement Platform
11.	App development using IOT
12.	Game Development
13.	Sentiment Analysis using Social Media responses
14.	To design dynamic website using advanced web technologies
15.	Identifying accident prone area for roads

Note: Project topic can be selected as per the Domain and current Trends in the Technology.

T.E. Semester –VI
Choice Based Credit Grading Scheme with Holistic Student Development (CBCGS- H 2019)
TCET Autonomy Scheme (w.e.f. A.Y. 2020-21)

B.E (Information Technology)						T.E(SEM : VI)	
Course Name: Research Based Learning II						**Course Code:**HSD-ITRBL601	
Teaching scheme (Holistic Student Development - HSD) (Conducted in the beginning of Semester during first 3 Weeks						Examination Scheme (Formative/ Summative)	
Modes of Teaching / Learning / Weightage						**Assessment/Evaluation Scheme**	
Hours						Presentation	Report	Term Work
Theory	Tutorial	Practical	Contact Hours	Credits		AC	AC	TW
-	-	30	30	1		25	25	50
AC- Activity Evaluation								
Total weightage of marks for continuous evaluation of Term work/Report: Formative (40%), Timely Completion of Practical (40%) and Attendance/Learning Attitude (20%).								
Prerequisite: Subject knowledge, Domain knowledge								

Course Objectives:

This course is focused to give basic aspects of Idea generation, Competitive programming, Research and development, including research methodologies, innovation.

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

S.N.	Course Outcome	Cognitive level attainment as per revised Bloom Taxonomy
1	Student will be able to create new idea for problem solving related to industry or societal issues.	L1, L2, L3,L4
2	Students will be to develop the code for given problem definition in a competitive environment.	L1, L2, L3,L4
3	Students will be to publish research paper.	L1, L2, L3,L4,l5,L6
4	Student will be able to create new idea for problem solving related to industry or societal issues.	L1, L2, L3,L4,l5,L6

Detailed Syllabus:

Module No.	Topics	Cognitive level attainment as per revised Bloom Taxonomy
1	**Idea Generation** I. **Introduction to idea Generation**: Introduction to invention and innovation, managing creativity, Techniques for generating ideas, Steps for Idea generation to implementation. Transforming Idea into project with implementation II. Brainstorming session with peers for idea generation and assessment, Experience sharing by entrepreneurs or Hackathon Winners. (Idea must be such that it should be converted into project and further into Product if possible, it can be multidisciplinary projects also) **Idea competition and evaluation**	L1, L2, L3,L4
2	**Competitive Programming** I. Introduction to competitive programming, benefits, Tips for good programming performance, logic development (Problem Solving strategies, loops) II. Mock Evaluation/Experience sharing by good coders **Coding competition and evaluation**	L1, L2, L3,L4
3	**Research Publication** Forming interest groups with mentors, Topic Identification, Literature Survey, and Sketching of Idea/Design of Survey, Implementation, and Analysis of Results, Identifying journal /conference for publication conference paper, Publishing of research Paper/Survey paper. **Evaluation by faculty as per format**.	L1, L2, L3,L4,l5,L6
4	**Management of Innovation and Technical Change** What is innovation, kinds of Innovation, Innovation as a core business process, Developing an innovation strategy, Sources of innovation, Creating new products and services **Idea competition and evaluation.**	L1, L2, L3,L4,l5,L6

References:

Sr. No.	Title	Authors	Publisher	Edition	Year
1.	Research Methodology Methods and Techniques	C.R. Kothari	New Age International Limited,	2nd Edition	2004
2.	Entrepreneurship Development and Small Business Enterprise	Poornima M. Charantimath	Pearson Education India	5th Edition	2005
3.	Law Relating to Patents, Trade Marks, Copyright, Designs and Geographical Indications	B. L. Wadehra	Universal Law Publishing Co Ltd	Kindle	2004

Online References:

Sr. No.	Website Name	URL	Modules Covered
1.	https://www.statpac.com	https://www.statpac.com/online-software-manual/Basic-Research-Concepts.htm	M1
2.	https://www.slideshare.net	https://www.slideshare.net/25Mksp/management-technology-innovation-change	M2
3.	https://www.eng.ufl.edu	https://www.eng.ufl.edu/leadership/wp-content/uploads/sites/7/2015/02/Engineering-Entrepreneurship-Course-Overview.pdf	M4
4.	https://www.vesalius.edu	https://www.vesalius.edu/wp-content/uploads/2016/11/BUS213G-S15.pdf	M3