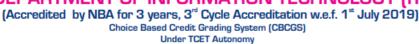# B.E. Semester-VII Syllabus

Choice Based Credit Grading Scheme- with Holistic Student Development

(CBCGS- H 2019)

TCET Autonomy Scheme (w.e.f. A.Y. 2022-23)

B.E. Semester – VII
Choice Based Credit Grading Scheme with Holistic Student Development (CBCGS- H 2019)
TCET Autonomy Scheme (w.e.f. A.Y. 2022-23)

B.E. Information Technology							B.E. (SEM : VII)		
Course Name: Machine Learning for IT Application Development							**Course Code: PCC- IT 701**		
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%)									
Prerequisite: Linear Algebra, Calculus, Probability, Statistics.									

Course Objective:

The course intends to deliver the fundamentals field of Machine Learning, in particular focusing on the core concepts of supervised and unsupervised learning. Students will learn the algorithms which underpin many popular Machine Learning techniques, as well as developing an understanding of the theoretical relationships between these algorithms.

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

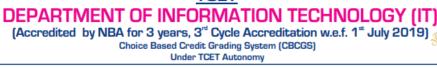| Sr. No.	Course Outcomes	Cognitive levels of attainment as per Bloom's Taxonomy
1	Understand basics of ML	L1, L2
2	Apply pre-processing techniques	L1, L2, L3
3	Understand and apply regression for learning and assess the outcome	L1, L2, L3, L4
4	Apply classification for learning and assess the outcome	L1, L2, L3, L4
5	Apply optimization techniques for performance enhancement	L1, L2, L3, L4
6	Apply unsupervised and reinforcement learning concepts and assess the outcome	L1, L2, L3, L4

Detailed Syllabus:

Module No.	Topics	Hrs.	Cognitive levels of attainment as per Bloom's Taxonomy
1	**Introduction to Machine Learning** Machine Learning terminology, Types of Machine Learning, Issues in Machine Learning, Application of Machine Learning, Steps in developing ML application, How to choose the right algorithm	5	L1, L2
2	**Data Preprocessing** Data Transformation, Data Handling (Missing, Imbalanced), Outlier detection and Visualization, Feature selection and extraction	10	L1, L2, L3
3	**Supervised Learning with Regression** Simple Linear, Gradient Descent, Multiple Linear, Polynomial, Regularization, Evaluation Metric, Use case	5	L1, L2, L3, L4
4	**Supervised Learning with Classification** k Nearest Neighbor, Logistic Regression, Naïve Bayes, Linear SVM, Kernels, Decision Tree (CART), Issues in DT learning, Ensembles (Bagging – Random Forest, Boosting – AdaBoost), Evaluation Metric, Use case	13	L1, L2, L3, L4
5	**Optimization Techniques** Model Selection techniques, Cross Validation, Grid Search method, Optimization formulations, Gradient and search-based optimization for machine learning, Linear, quadratic, nonlinear, and mixed integer programme, Multi-objective and multi-criteria decision-making - evolutionary tools	6	L1, L2, L3, L4
6	**Unsupervised Learning with clustering and Reinforcement Learning** Expectation Maximization algorithm, Use case Elements of reinforcement Learning, Online Learning (Temporal Difference), Use case	6	L1, L2, L3, L4
	Total Hours	**45**	

List of Experiments:

Practical No.	Type of Experiment	Experiment topic	Hrs	Cognitive levels of attainment as per Bloom's Taxonomy
1	**Basic Experiments**	Write a code to the FIND-S algorithm for finding the most specific hypothesis based on a given set of training data samples. Read the training data from a .CSV file	2	L1, L2
2		For a given set of training data examples stored in a .CSV file, implement and demonstrate the Candidate-Elimination algorithm to output a description of the set of all hypotheses consistent with the training example	2	L1, L2

3		Practical on Data transformation and Data Handling with Python	2	L1, L2, L3
4		Practical on Outlier detection and Visualization, Feature selection and extraction	2	L1, L2, L3
5		Write a program to implement Linear Regression and Multiple Linear Regression	2	L1, L2, L3, L4
6	**Design Experiment**	Write a program to implement Polynomial Regression and Multiple Linear Regression	2	L1, L2, L3, L4
7		Write a program to demonstrate the working of K nearest neighbor	2	L1, L2, L3, L4
8		Write a program to demonstrate the working of Support vector Machine	2	L1, L2, L3, L4
9		Write a program to demonstrate the working of Decision Tree	2	L1, L2, L3, L4
10	**Group Activity/ Case study**	Case study on Cross Validation, Grid Search method	2	L1, L2, L3, L4
11		Mini Project	10	L1, L2, L3, L4
Total Hrs.			**30**	

Books and References:

Sr. No	Title	Authors	Publisher	Edition	Year
1	Machine Learning In Action	Peter Harrington	DreamTech Press	1st	2012
2	Introduction to Machine Learning	Ethem Alpaydın	MIT Press	4th	2020
3	Machine Learning	Tom M. Mitchell	McGraw Hill	2nd	1997
4	Machine Learning An Algorithmic Perspective	Stephen Marsland	CRC Press	2nd	2011
5	Machine Learning — A Probabilistic Perspective	Kevin P. Murphy	MIT Press	1st	2012
6	Pattern Recognition and Machine Learning	Christopher M. Bishop	Springer	-	2006
7	Elements of Statistical Learning	Trevor Hastie, Robert Tibshirani, Jerome Friedman	Springer	-	2017

Online References:

Sr. No.	Website Name	URL	Modules Covered
1	www.analyticvidhya.com	https://www.analyticsvidhya.com/%20machine%20learning/	M1-M6
2	www.towardsdatascience.com	https://towardsdatascience.com/machine-learning/home	M1-M6
3	www.coursera.org	https://www.coursera.org/learn/machine-learning?utm_source=gg&utm_medium=sem&utm_content=07-StanfordML-IN&campaignid=1950458127&adgroupid=69480953983&device=c&keyword=machine%20learning%20online%20course	M1-M6

&matchtype=b&network=g&devicemodel=&adpostion=1t2&creativeid=351281535285&hide_mobile_promo&gclid=Cj0KCQiAn8nuBRCzARIsAJcdIfMYXtdIwVvfyr6ee_ewWcWrBdFmGWrJnWif67PHGt-sEH6r68QbhUoaAvmJEALw_wcB

B.E. Semester – VII
Choice Based Credit Grading Scheme with Holistic Student Development (CBCGS- H 2019)
TCET Autonomy Scheme (w.e.f. A.Y. 2022-23)

BE Information Technology							B.E SEM : VII			
Course Name: Wireless Networks							Course Code: PEC-IT 7011			
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**	
ISA: 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: Computer networks, Wireless Network, Modulation and Demodulation Techniques, PSTN **RBT** : Revised Bloom's Taxonomy										

Course Objective: The course intends to deliver the fundamentals of wireless network, analyse different wireless technologies, evaluate Ad- hoc networks and wireless sensor networks, analyse and evaluate the security threats and related security standards and learn design considerations for wireless networks.

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

Sr. No.	Course Outcomes	Cognitive levels of attainment as per Bloom's Taxonomy
1	Explain the basic concepts of wireless network and wireless generations	L1,L2
2	Demonstrate the different wireless technologies such as CDMA, GSM, GPRS etc.	L1,L2
3	Appraise the importance of Ad-hoc networks such as MANET and VANET and Wireless sensor networks	L1,L2,L3
4	Describe and judge the emerging wireless technologies standards such as WLL,WLAN,WPAN,WMAN	L1,L2,L3
5	Differentiate and support the security measures, standards. Services and layer wise security considerations	L1,L2,L3,L4
6	Explain the design considerations for deploying the wireless network infrastructure.	L1,L2,L3,L4

Detailed Syllabus:

Module No.	Topics	Hrs.	Cognitive levels of attainment as per Bloom's Taxonomy
1	**Fundamentals Wireless Communication**	7	L1,L2,L3,L4
	Fundamentals of Wireless. Communication, Advantages limitations and application, wireless media, Infrared Modulation Techniques, DSSS and FHSS Frequency Spectrum: Radio and Infrared; Wireless generations: 1G: Cellular,2G: Mobile Radio,3G: UMTS- Security related Encryption Algorithm,4G		
2	**Evolution of Wireless Technologies**	8	L1,L2,L3,L4
	Multiple Access Technique: TDMA, FDMA, CSMA, CDMA Wireless Technologies: GSM GPRS, EDGE,CDMA,LTE, UMTSX		
3	**Types of Wireless Networks**	8	L1,L2,L3,,L4
	Ad-hoc: MANET & VANET, Application, Advantage and limitations; Wireless Sensor Network: Application, advantages and limitations		
4	**Emerging Wireless Technologies and standards**	8	L1,L2,L3,L4,L5, L6
	WLL , WLAN- 802.11 (Wi-Fi), WPAN- 802.15.1/3/4 (Bluetooth Zigbee), WMAN-802.16a (Wi- max) , Wi-max and LTE /3GPP comparison		
5	**Wireless Network Security**	7	L1,L2,L3,L4,L5, L6
	The need, attacks, security serviced, WEP, Mobile IP, VPN(PPTP, LLTP, IPSec), Network Layer Security, Transport Layer Security Email Security: PGP, S/ MIME		
6	**Wireless Network Design Considerations**	7	L1,L2,L3,L4,L5, L6
	Wireless technology, Cisco Unified Wireless Network, Designing Wireless Networks with Lightweight Access Points and Wireless LAN Controllers		
	Total Hours	**45**	

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 (CBCGS)
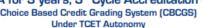Under TCET Autonomy

Capstone Project Guide Lines

Title: A Case study of wireless integration into an Enterprise Network:

Sr. No	Work to be done	Hrs.	Cognitive levels of attainment as per Bloom's Taxonomy
1	Identification and Study of different types of wireless networks as per IEEE standards applicable for end-to-end communication - (Parameters require -- Physical layer standard, maximum performance, Frequency range, Bandwidth, Technology compatibility, Backward compatibility)	2	L1, L2, L3
2	Project Title Identification as per literature survey	2	L1, L2, L3, L4
3	Finalize design requirements of wireless network suitable for enterprise network perspective --- Gathering the hardware, software requirements to deploy network etc.	4	L1, L2, L3, L4, L5
4	Selection of suitable Authentication, Privacy for suitable wireless network	2	L1, L2, L3, L4
5	Test the requirements of IEEE 802.11 network type ---Threats, Vulnerabilities, and Countermeasures	2	L1, L2, L3, L4
6	Test the Wireless network vulnerability assessments – Suitable tools, Features	4	L1, L2, L3, L4
7	Network Protocol Analyzer Tools - Netstumbler etc.	4	L1, L2, L3
8	Wireless Deployment Considerations	1	L1, L2, L3, L4
9	Wireless policy recommendation – Based on security policy, Risk assessment, Information classification, Network segregation, wireless access point security, wireless client, authentication, scalability, encryption etc.	3	L1, L2, L3, L4, L5, L6
10	Testing of Mini Project – Technical feasibility study to be carried out for effective operations	2	L1, L2, L3, L4, L5, L6
11	Preparation of Report	4	L1, L2, L3, L4, L5, L6
	Total Hours	**30**	

Books and References:

Sr. No	Title	Authors	Publisher	Edition	Year
1	Wireless Communications and networks	William Stallings	Pearson / Prentice Hall	3rd	2007
2	Wireless Communications	T.L.Singal,	TMH	2nd	2011
3	Authorized Self-Study Guide, Designing for Cisco Internetwork Solutions (DESIGN)	Diane Teare.	Cisco Press	2nd	2003
4	Wireless communication and networking	Vijay Garg	Elsevier	2nd	2007

Online References:

S. No.	Website Name	URL	Modules covered
1	http://ciscodocuments.blogspot.com	http://ciscodocuments.blogspot.com/2011/06/chapter-2-applying-methodology-to.html	M6
2	www.rfpage.com	https://www.rfpage.com/evolution-of-wireless-technologies-1g-to-5g-in-mobile-communication/	M2
3	www.computernetworkingnotes.com	https://www.computernetworkingnotes.com/ccna-study-guide/types-of-wireless-network-explained-with-standards.html	M3
4	www.link-labs.com	https://www.link-labs.com/blog/types-of-wireless-technology	M4
5	www.tutorialspoint.com	https://www.tutorialspoint.com/network_security/network_security transport_layer.htm	M5
6	http://www.ciscopress.com	http://www.itsolutions.pro/images/stories/docs/cisco.press.designing.for.cisco.internetwork.solutions.desgn.pdf	M6

B.E. Semester – VII
Choice Based Credit Grading Scheme with Holistic Student Development (CBCGS- H 2019)
TCET Autonomy Scheme (w.e.f. A.Y. 2022-23)

BE Information Technology							B.E (SEM : VII)		
Course Name: High Performance Computing							**Course Code: PEC-IT 7012**		
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
ISA: 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: Computer Basics, Procedural Programming Languages									

Course Objective: The objective of the course is to introduce the concepts of modern processors and optimization techniques for serial code. To study parallel processing as it pertains to high-performance computing and able to design, develop and analyse parallel programs on high performance computing resources using parallel programming paradigms. To introduce the concepts of Parallel Programming using OpenMP and MPI.

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	Illustrate parallel processing approaches L1,L2	L1,L2
2	Describe different parallel processing platforms involved in achieving High Performance Computing. L1,L2	L1,L2
3	Compare different design issues in parallel programming	L1,L2,L3,L4
4	Discuss parallel programming issues and Develop parallel programs.	L1,L2,L3,L4
5	Analyze the performance measures of parallel programs	L1,L2,L3,L4
6	Describe parallel programming using message passing paradigm using open source APIs..	L5,L6

Detailed Syllabus:

Module No.	Topics	Hrs.	Cognitive levels of attainment as per Bloom's Taxonomy
1	**Introduction** Modern Processors, Introduction to Parallel Computing: Motivating Parallelism, Scope of Parallel Computing, Levels of parallelism (instruction, transaction, task, thread, memory, function) Classification Models: Architectural Schemes (Flynn's, Feng's, Handler's) and Memory access (Shared Memory, Distributed Memory, Hybrid Distributed Shared Memory) Parallel Architectures: Pipeline Architecture, Array Processor, Multiprocessor Architecture, Systolic Architecture, Data Flow Architecture.	06	L1, L2
2	**Pipeline Processing** Introduction, Pipeline Performance, Arithmetic Pipelines, Pipeline instruction processing, Pipeline stage design, Hazards, Dynamic instruction scheduling	06	L1,L2
3	**Parallel Programming Platforms** Parallel Programming Platforms: Implicit Parallelism: Trends in Microprocessor & Architectures, Limitations of Memory System Performance, Dichotomy of Parallel Computing Platforms, Physical Organization of Parallel Platforms, Communication Costs in Parallel Machines.	08	L1, L2, L3,L4
4	**Parallel Algorithm Design** Principles of Parallel Algorithm Design: Preliminaries, Decomposition Techniques, Characteristics of Tasks and Interactions, Mapping Techniques for Load Balancing, Parallel Algorithm Models, Examples of Parallel Algorithms (Bitonic Sort, the parallel formulation of oddeven transposition sort)	09	L1, L2, L3,L4
5	**Performance Measures** Performance Measures : Speedup, execution time, efficiency, cost, scalability, Effect of granularity on performance, Scalability of Parallel Systems, Amdahl's Law, Gustavson's Law, Performance Bottlenecks	06	L1, L2, L3,L4
6	**MPI Programming** Programming Using the Message-Passing Paradigm: Principles of Message Passing Programming, The Building Blocks: Send and Receive Operations MPI: the Message Passing Interface, Topology and Embedding, Overlapping Communication with Computation, Collective Communication and Computation Operations, Introduction to OpenMP	10	L5,L6
	Total Hours	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 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 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.	Introduction to Parallel Computing	Ananth Grama, Anshul Gupta, George Karypis, Vipin Kumar	Pearson Education	2nd Edition	2007
2.	Parallel Computing	M. R. Bhujade	New Age International Publishers	2nd Edition	2009
3.	Advanced Computer Architecture: Parallelism, Scalability, and Programmability	Kai Hwang, Naresh Jotwani	McGraw Hill	2nd Edition	2010
4.	Introduction to High Performance Computing for Scientists and Engineers.	Georg Hager, Gerhard Wellein	Taylor & Francis	Special Indian Edition	2011

Online Recourses:

Sr. No.	Website Name	URL	Modules covered
1	www.vssut.ac.in	www.vssut.ac.in › lecture notes › lecture1428643084	M1-M6
2	hpc.llnl.gov	https://hpc.llnl.gov › training › tutorials	M1,M2
3	www.researchgate.net	https://www.researchgate.net › publication › 260724344_An_Introduction	M1-M6

B.E. Semester – VII
Choice Based Credit Grading Scheme with Holistic Student Development (CBCGS- H 2019)
TCET Autonomy Scheme (w.e.f. A.Y. 2022-23)

BE Information Technology							B.E (SEM: VII)		
Course Name: Advanced Internet Programming							**Course Code: PEC-IT 7013**		
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**
ISA: 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: Basics of Internet Programming, Web Programming									

Course Objective: The course intends to deliver in depth understanding of search engine basics, search engine optimization, key concepts and terminologies of web analytics, working of web analytics and their impact. It also helps to know the principles, tools and methods of web analytics, how to get web data insights using Clickstream and Qualitative Analysis. Along with this it also provides fundamental concepts of applying analytics for business situations and measuring success by actionable KPI's using quantitative and qualitative methods for web analytics.

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	Determine SEO Objectives and Develop SEO plan prior to Site Development.	L1, L2, L3, L6
2	Explain Search Engine Optimization Techniques and Develop Keyword Generation.	L1, L2, L3, L6
3	Know the concepts and terminologies related to web analytics.	L1, L2, L3, L4
4	Explore various parameters used for web analytics and their impact.	L1, L2, L3, L4, L6
5	Get experience on websites, web data insights and conversions using Clickstream and Qualitative Analysis.	L1, L2, L3, L4, L6
6	Explore Measuring Success by actionable KP'Is.	L1, L2, L3, L4, L5

Detailed Syllabus:

Module No.	Topics	Hrs.	Cognitive levels of attainment as per Bloom's Taxonomy
1	**Basics of Search Engine** Search Engine Basics, Algorithm based Ranking Systems: Determining Searcher Intent and Delivering Relevant, Fresh Content, Analysing Ranking Factors, Using Advanced Search Techniques, Vertical Search Techniques, Country Specific search engines. Determining SEO Objective and Finding Your Site's Audience: Setting SEO Goals and Objective Developing SEO plans Prior to Site Development, SEO for Raw traffic, E-commerce Sales, Mindshare/Branding, Direct Marketing, Reputation Management, Ideological Influence.	07	L1, L2, L3, L6
2	**Search Engine Optimization** Getting started SEO: Defining Your Site's Information Architecture, Auditing an Existing Site to identify SEO Problems, Identifying Current Server Statistic Software and Gaining Access, Determining Top competitors, Benchmarking Current Indexing Status, Current Rankings, Benchmarking Current Traffic Source and Volumes, Conduct SEO/Website SWOT analysis. Keyword Generation, Creating Pages, Website Structure, Creating Content, Creating Communities, building Links Using Google Analytics, Social Media Optimization, Creating Pay-per-click Campaigns, Optimizing PPC Campaigns through Quality Score optimization, Tracking Results and Measuring Success.	08	L1, L2, L3, L6
3	**Introduction to Web Analytics** What is Web Analytics, Web Analytics Importance, Process of Web Analytics, Key Metrics Web Analytics and User Experience, Get to Know Your Website, A Model of Analysis, Showing Your Work, Context Matters, Data Collection, Clickstream Data, Weblogs, Beacons, JavaScript Tags, Packet Sniffing, Outcomes data, Competitive data, Search Engine Data.	06	L1, L2, L3, L4
4	**Web Analytics Working & Google Analytics** Web Analytics Working: Log File Analysis, Page Tagging (Cookies, Accuracy, Accounts and Profiles, Click Analytics). Metrics and Dimensions: Visits, Unique Visitors, Pageviews, Pages/Visit, Average Visit Duration, Bounce Rate, % New Visits. Interacting with Data in Google Analytics: Plot Rows, Secondary Dimension, Sort Type, Search, Beyond Tables, Analytics, Cookies, Accounts vs Property, Tracking Code, Tracking Unique Visitors, Demographics, Page Views & Bounce Rate Acquisitions, Custom Reporting.	08	L1, L2, L3, L4, L6
5	**Clickstream and Qualitative Analysis** Understanding Visitor Acquisition Strengths, Click Density Analysis, Measuring Visits to Purchase, Sources of Traffic, Visitor Analysis, Traffic Analysis, Internal Site Search Analysis, Search Engine Optimization (SEO) Analysis, Pay Per Click/Paid Search Analysis, Direct Traffic Analysis, Email Campaign Analysis, Rich Experience Analysis(Flash, Video, and Widgets), Customer Centricity, Site Visits, Surveys, Questionnaires, Website Surveys, Post visits, Creating and Running, Benefits of surveys, Critical components of successful strategy.	08	L1, L2, L3, L4, L6
6	**Measuring Success** Goals and Conversions, Conversion Rate, Goal Reports in Google Analytics, Usage of Reports, Performance Indicators, What Can You Measure on a Website that Can Constitute a Goal. Actionable Outcome KPIs: Task Completion Rate, Share of Search, Visitor Loyalty and Recency, RSS/Feed Subscribers, % of Valuable Exits Moving Beyond Conversion Rates: Cart and Checkout Abandonment, Days and Visits to Purchase, Average Order Value, Primary Purpose Measuring Macro and Micro	08	L1, L2, L3, L4, L5

Conversions, Quantifying Economic Value,Measuring Success for a Non-ecommerce Website: Visitor Loyalty, Visitor Recency, Length of Visit, Depth of Visit		
Total Hr.	**45**	

Capstone Project Guidelines:

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. The group should meet with the concerned faculty during Laboratory hours and the progress of work discussed must be documented.

3.Mini project should cover following things:

- Develop website and setup Google Analytics account for the same and implement tracking in website.
- Create and analyze SEO Audit report for a given specific website.
- Conduct SEO/Website SWOT analysis for a given specific website.
- Study the keyword generation and Keyword Research Tools. (For E.g. Google AdWords, Word Tracker, Bing Ads Intelligence)
- Develop SEO optimized website.
- Study web analytics tools for Stat tracker and Visitor Behavior
- Study web analytics tools for conversion and blog Tools.
- Tracking and measuring success of website.
- Web Analytics Case study

4. Each group must present their work to respective subject In charge.

5. 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.	The Art of an SEO	Eric Enge, Stephan Spencer, Jessie Stricchiola	O'Reilly Publication	3rd Edition	2015
2.	Advance Internet Technology	Dr. Deven Shah	Dreamtech Publication	1st Edition	2014
3.	Web Analytics 2.0: The Art of Online Accountability and Science Of Customer Centricity	Avinash Kaushik	Sybex	1st Edition	2009
4.	Practical Web Analytics for User Experience: How Analytics can help you Understand your Users	Michael Beasley	Morgan Kaufmann	1st Edition	2013
5.	Game Analytics: Maximizing the Value of Player Data"	Magy Seif El-Nasr, Anders Drachen, Alessandro Canossa, eds.	Springer	1st Edition	2013
6.	Successful Analytics: Gain Business Insights by Managing Google Analytics	Brian Clifton	Advanced Web Metrics Ltd	1st Edition	2015
7.	Google Analytics	Justin Cutroni	O'Reilly	-	2010
8.	Google Analytics Breakthrough	Eric Fettman, Shiraz Asif, Feras Alhlou	Wiley	-	2016

Online References:

Sr. No.	Website Name	URL	Modules covered
1.	http://www.webopedia.com	http://www.webopedia.com/TERM/S/SEO.html	M1, M2
2.	https://www.liferay.com/	https://www.liferay.com/community/wiki/-/wiki/Main/Search+Engine+Optimization https://searchapparchitecture.techtarget.com/definition/Web-services	M1, M2
3.	www.webstrategyforeveryone.com	www.webstrategyforeveryone.com/web-analytics-introduction/	M3
4.	www.analytics.google.com	www.analytics.google.com/analytics/academy/course/6	M4
5.	www. rudderstack.com www.study.com	https://rudderstack.com/blog/data-mining-for-clickstream-analytics/	M5

		www.study.com/academy/lesson/clickstream-analysis-definition-uses.html	
6.	www.learn.g2.com www.info.webbege.com	www.learn.g2.com/website-analytics www.info.webbege.com/blog/measuring-success-why-web-analytics-are-a-must	M6

B.E. Semester – VII
Choice Based Credit Grading Scheme with Holistic Student Development (CBCGS- H 2019)
TCET Autonomy Scheme (w.e.f. A.Y. 2022-23)

BE Information Technology							B.E (SEM : VII)			
Course Name: Big Data Analytics							**Course Code: PEC-IT 7014**			
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)**	**Tot al**	
Theory	**Tutorial**	**Practical**	**Contact Hours**	**Credits**	**IA**	**ESE**	**PR/OR**	**TW**		
3	-	2@	5	4	25	75	25	25	**150**	
ISA: 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: Database Management System, Data Warehouse and Mining, Machine Learning.										

Course Objective: The course intends to explore the fundamentals big data analytics and to learn the analytics techniques using various search methods and visualization techniques. Also, to learn the map reduce techniques and various data stream mining techniques.

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	Explain the motivation for big data systems and identify the main sources of Big Data in the real world.	L1, L2
2	Demonstrate an ability to use frameworks like Hadoop, NOSQL to efficiently store retrieve and process Big Data for Analytics.	L2,L3
3	Implement several Data Intensive tasks using the Map Reduce Paradigm.	L4,L5
4	Apply several newer algorithms for Clustering Classifying and finding associations in Big Data	L4,L5
5	Design algorithms to analyze Big data like streams, Web Graphs and Social Media data.	L5,L6
6	Design and implement successful Recommendation engines for enterprises.	L5,L6

Detailed Syllabus:

Module No.	Topics	Hrs.	Cognitive levels of attainment as per Bloom's Taxonomy
1	**Introduction to Big Data**	03	L1,L2
	Introduction to Big Data, BigData characteristics, types of Big Traditional vs. Big Data business approach, Big Data Challenges, Examples of Big Data in Real Life, Big Data Applications.		
2	**Introduction to Big Data Frameworks: Hadoop, NOSQL**	08	L2,L3
	What is Hadoop? Core Hadoop Components; Hadoop Ecosystem; Overview of: Apache Spark, Pig, Hive, HBase, Sqoop What is NoSQL? NoSQL data architecture patterns: Key-value stores, Graph stores, Column family (Bigtable) stores, Document stores, Mongo DB.		
3	**Map Reduce Paradigm**	09	L4,L5
	MapReduce: The Map Tasks, Grouping by Key, The Reduce Tasks, Combiners, Details of Map Reduce Execution, Coping with Node Failures. Algorithms Using MapReduce: Matrix-Vector Multiplication by MapReduce, Relational-Algebra Operations, Computing Selections ByMapReduce, Computing Projections by MapReduce, Union, Intersection, and Difference by MapReduce, Computing Natural Join by MapReduce, Grouping and Aggregation by MapReduce, Matrix Multiplication, Matrix Multiplication with One MapReduceStep. Illustrating use of Map Reduce with use of real-life databases and Applications.		
4	**Mining Big Data Streams**	07	L4,L5
	Stream-Management System, Examples of Stream Sources, Stream Queries, Issues in Stream Processing. Sampling Data in a Stream: Sampling Techniques. Filtering Streams: The Bloom Filter. **Counting Distinct Elements in a Stream:** The Count-Distinct Problem, The Flajolet-Martin Algorithm, Combining Estimates, Space Requirements. Counting Ones in a Window: The Cost of Exact Counts, The Datar-Gionis-Indyk- Motwani Algorithm, Query Answering in the DGIM Algorithm.		
5	**Big Data Mining Algorithms**	09	L5,L6
	Frequent Pattern Mining: Handling Larger Datasets in Main Memory Basic Algorithm of Park, Chen, and Yu. The SON Algorithm and MapReduce. Clustering Algorithms: CURE Algorithm. Canopy Clustering, Clustering with MapReduce **Classification Algorithms:** Parallel Decision trees, Overview SVM classifiers, K-Nearest Neighbor classifications for Big Data, One Nearest Neighbor, Logistic regression **Predictive Analytics**- Dimension Reduction using PCA, Simple linear regression- Multiple linear regression- Interpretation of regression coefficients. Visualizations - Visual data analysis techniques- interaction techniques - Systems and applications.		
	Big Data Analytics Applications	09	,L5,L6

6	**Link Analysis:** PageRank Definition, Structure of the web, dead ends, Using Page rank in search engine, Efficient computation of Page Rank: PageRank Iteration Using Map Reduce, Topic sensitive Page Rank, link Spam, Hubs and Authorities, HITS Algorithm. **Mining Social- Network Graphs:** Social Networks as Graphs, Types, and Clustering of Social Network Graphs, Direct Discovery Communities, and Counting triangles using Map-Reduce. **Recommendation Engines**: Model for Recommendation Systems, Content-Based Recommendations, Collaborative Filtering.		
	Total Hours	**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 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 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.	Big Data Analytics	RadhaShankarmani, M Vijayalakshmi	Wiley Publications	3rd	2016
2.	Mining of Massive Datasets	AnandRajaraman and Jeff Ullman	Cambridge University Press	1st	2012
3.	Hadoop in Practice	Alex Holmes	Alex Holmes	2nd	2015
4.	Big Data Analytics with R and Hadoop	VigneshPrajapati	Packt Publishing Limited	1st	2016

Online References:

Sr. No.	Website Name	URL	Modules Covered
1	www.mmds.org	http://www.mmds.org	M1-M6
2	www.guru99.com	https://www.guru99.com/	M1,M2
3	www.edureka.co	https://www.edureka.co/blog/hadoop-tutorial/	M1, M2
4	www.tutorailride.com	https://www.tutorialride.com/big-data-analytics	M1-M6

B.E. Semester – VII
Choice Based Credit Grading Scheme with Holistic Student Development (CBCGS- H 2019)
TCET Autonomy Scheme (w.e.f. A.Y. 2022-23)

BE Information Technology							B.E (SEM : VII)		
Course Name: DevOps							Course Code: PEC-IT 7015		
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	-	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: Operating System, Virtualization, Cloud Computing, Java and Web Programming, and Software Engineering.									

Course Objective: This subject intends to deliver fundamentals of DevOps to apply the principles and practices of DevOps and automation on a project

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	Remember the importance of DevOps tools used in software development life cycle	L1,L2
2	To examine and apply different Version Control tools like GIT, CVS or Mercurial	L1,L2,L3,L4
3	To be familiarized with the importance of Jenkins to Build, Deploy and Test Software Applications	L1,L2,L3,L4
4	Analyze & Illustrate the Containerization of OS images and deployment of applications over Docker	L1,L2,L3,L4
5	Summarize the importance of Software Configuration Management in DevOps and Synthesize the provisioning	L1,L2,L3,L4,L5
6	Apply DevOps methodologies and tools to improve application development efficiency	L1,L2,L3,L4,L5,L6

Detailed Syllabus:

Module No.	Topics	Hrs.	Cognitive levels of attainment as per Bloom's Taxonomy
1	**Introduction to Devops**	7	L1,L2
	What Is Devops ,History of Devops, Devops definition, DevOps Objectives, , DevOps and Software Development Life Cycle,Waterfall Model, Agile Model,DevOps Ecosystem, DevOps on the Cloud,Market Trends, Infrastructure As A Code		
2	**Devops and Automation**	8	L1,L2
	Version Control, Continuous Integration, Continuous Testing, Configuration Management, Continuous Deployment, Containerization, Continuous Monitoring, Tool pipelining		
3	**Version Control Systems**	8	L1,L2,L3,L4,L5, L6
	Version control systems , Version Control System types, Difference between CVCS and DVCS, Introduction to Git, importance of Git for an organization, Common commands in Git, Working with Remote Repositories, Branching and Merging in Git, Git workflows, Git cheat sheet, other version controls, CVS , Mercurial		
4	**Continuous Integration**	8	L1,L2,L3,L4,L5, L6
	Introduction to Continuous Integration , Continuous Delivery and Deployment , Benefits of CI/CD ,continuous integrations tools, Jenkins and its Architecture, Jenkins Management, Build Setup, Git and Jenkins Integration, Build & Test Applications with Continuous Integration, Scheduling build Jobs		
5	**Virtualization & Containerization**	8	L1,L2,L3,L4,L5, L6
	Benefits and use cases for containerized environments, Shipping Transportation Challenges, Introduction to Docker , Use case of Docker, Platforms for Docker, Dockers vs. Virtualization, Understanding images and containers, Introduction to Container, Container Life Cycle Installing and Configure Docker for creating Containers of Operating Systems ,Build, deploy and manage web or Java application on Docker, container environment using a Dockerfile		
6	**Continuous Testing and Software Configuration Management**	6	L1,L2,L3,L4,L5
	Introduction to Continuous Testing , Agile Testing Techniques, Life Cycle, testing tools, testing using Selenium tool Software Configuration Management ,provisioning, Importance, provisioning using Chef/Puppet/Ansible or Saltstack.		
	Total Hours	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 apply DevOps.

4. Students will do Installation, configuration and also latest DevOps tools for project

5. Students will try to consider following points in their Mini Project
a) Version control.
b) Integration tool
c) Testing Tool
d) Deployment
e) Configuration

6. Each group along with the concerned faculty shall identify a potential problem statement for project 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 DevOps 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	

TCET

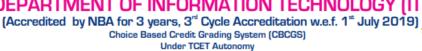**DEPARTMENT OF INFORMATION TECHNOLOGY (IT)**
(Accredited by NBA for 3 years, 3rd Cycle Accreditation w.e.f. 1st July 2019)
Choice Based Credit Grading System (CBCGS)
Under TCET Autonomy

Books and References:

Sr. No	Title	Authors	Publisher	Edition	Year
1	DevOps Tools from Practitioner's ViewPoint	Deepak Gaikwad, Viral Thakkar	Wiley	--	2016
2	The DevOps Adoption Playbook: A Guide to Adopting DevOps in a MultiSpeed IT Enterprise	Sharma S	Wiley	First	2017
3	DevOps for Dummies	Gene Kim, Kevin Behr, George Spafford	John Wiley & Sons	First	2014
4	Practical DevOps	Joakim Verona	Packt Publishing	First	2016

Online References:

Sr. No.	Website Name	URL	Modules Covered
1	www.javatpoint.com	https://www.javatpoint.com/devops	M1,M2,M3,
2	www.guru99.com	https://www.guru99.com/devops-tutorial.html	M4,M5,M6
3	www.tutorialspoint.com	https://www.tutorialspoint.com/devops_tutorials.htm	M1,M2,M3,M4,M5, M6
4	www.simplilearn.com	https://www.simplilearn.com/tutorials/devops-tutorial	M3,M4
5	/www.edureka.co	https://www.edureka.co/blog/devops-tutorial	M1,M2,M3,M5
6	https://www.jenkins.io	https://www.jenkins.io/doc/tutorials/	M4
7	https://github.com	https://github.com/learn/devops	M3
8	www.dotnettricks.com	https://www.dotnettricks.com/learn/devops	M1,M2,M5,M6

B.E. Semester – VII
Choice Based Credit Grading Scheme with Holistic Student Development (CBCGS- H 2019)
TCET Autonomy Scheme (w.e.f. A.Y. 2022-23)

B.E. Information Technology							B.E (SEM : VII)		
Course Name: Soft Computing							**Course Code: PEC-IT 7021**		
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**	**150**
3	-	2@	5	**4**	25	75	25	25	
IA: In-Semester Assessment- Paper Duration – 1.5 Hours ESE : End Semester Examination- Paper Duration - 3 Hours The weightage of marks for continuous evaluation of Term work/Report: Formative (40%), Timely completion of practical (40%) and Attendance / Learning Attitude (20%) @ Capstone Project									
Prerequisite: Algorithm, Programming skills in C, C++, or Java, MATLAB, Python etc.									

Course Objective: To inculcate interdisciplinary engineering skills this course will cover fundamental concepts used in soft computing. The concepts of Fuzzy logic (FL) will be covered first, followed by Artificial Neural Networks (ANNs) and optimization techniques using Genetic Algorithm (GA). Applications of Soft Computing techniques to solve a number of real life problems will be covered to have hands on practices. In summary, this course will provide exposure to theory as well as practical systems and software used in soft computing.

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	List the facts and outline the different process carried out in fuzzy logic, ANN and Genetic Algorithms.	L1,L2
2	Explain the concepts and meta-cognitive of soft computing.	L1,L2
3	Apply Soft computing techniques the solve character recognition, pattern Classification, regression and similar problems.	L1,L2,L3
4	Outline facts to identify process/procedures to handle real world problems using soft computing.	L1,L2,L3,L4,L5,L6
5	Evaluate various techniques of soft computing to defend the best working solutions	L1,L2,L3,L4,L5,L6
6	Design hybrid system to revise the principles of soft computing in various applications.	L1,L2,L3,L4,L5,L6

Detailed Syllabus:

Module No.	Topics	Hrs	Cognitive levels of attainment as per Bloom's Taxonomy
1	**Introduction**	3	
	What is Soft Computing? Difference between Hard and Soft computing, Requirement of Soft computing, Major Areas of Soft Computing, Applications of Soft Computing.		L1,L2
2	**Fuzzy Systems**	8	
	Fuzzy Set theory, Fuzzy versus Crisp set, Fuzzy Relation, Fuzzification, Minmax Composition, Defuzzification Method, Fuzzy Logic, Fuzzy Rule based systems, Predicate logic, Fuzzy Decision Making, Fuzzy Control Systems, Fuzzy Classification		L1,L2
3	**Neural Network I**	10	
	Artificial Neural Networks: Supervised Learning: Introduction and how brain works, Neuron as a simple computing element, The perceptron, Backpropagation networks: architecture, multilayer perceptron, backpropagation learning-input layer, accelerated learning in multilayer perceptron, The Hopfield network, Bidirectional associative memories (BAM), RBF Neural Network.		L1,L2,L3
4	**Neural Network II**	10	
	Unsupervised Learning: Hebbian Learning, Generalized Hebbian learning algorithm, Competitive learning, Self- Organizing Computational Maps: Kohonen Network. Building blocks of Adaptive Resonance, Substrate of resonance, Structural details of the resonance Model, Adaptive Resonance Theory I(ART Neurophysiological Evidence for ART Mechanism Character Recognition: Introduction, General Algorithm Architecture for Character Recognition: Binarization, Preprocessing, Filters, Smoothing, Skew Detection and Correction, Slant Correction, Character Normalization, Thinning, Segmentation, Multilingual OCR by Rule-Based Approach and ANN Rule-Based Approach: Classification, Tests, Rules Artificial Neural Network: Inputs, Outputs, Identification Results of Multilingual OCR		L1,L2,L3,L4,L5,L6
5	**Genetic Algorithms**	6	
	History of Genetic Algorithms (GA), Working Principle, Various Encoding methods, Fitness function, GA Operators- Reproduction, Crossover, Mutation, Convergence of GA, Bit wise operation in GA, Multi-level Optimization.		L1,L2,L3,L4,L5,L6
6	**Hybrid Computing**		L1,L2,L3,L4,L5,L6
	Introduction, Neuro-Fuzzy Hybrid Systems, Adaptive Neuro-Fuzzy Inference System (ANIFS): Introduction, ANFS Architecture, Hybrid Algorithm, ANFIS as a Universal Approximator, Simulation Examples: Two-input Sinc Function and Three Input Nonlinear Function Genetic Neuro-Hybrid Systems: Properties of Genetic Neuro-Hybrid Systems, genetic Algorithm based Back-propagation Network, Advantages of Neuro-Genetic Hybrids, Genetic Fuzzy Hybrid and Fuzzy Genetic Hybrid Systems Genetic Fuzzy Rule based Systems, Advantages of Genetic Fuzzy Hybrids.	8	
	Total Hours	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 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 may do survey for different application which they can create project.

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

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

6. 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	Title	Authors	Publisher	Edition	Year
1	Principles of Soft Computing, Wiley India, 2007	S.N. Sivanandan and S.N. Deepa	Wiley India	Second	2007
2	Neuro-Fuzzy and Soft Computing, A Computational Approach to Learning and Machine Intelligence	J.-S. R. Jang, C. –T. Sun, E. Mizutani,	PHI Learning Private Limited	First	2014

| 3 | Genetic Algorithms, in search, optimization and Machine Learning | David E. Goldberg | Pearson | First | 1989 |

Online References:

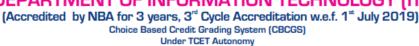| Sr.	Website Name	URL	Modules Covered
1	https://nptel.ac.in	https://nptel.ac.in/courses/106/105/106105173/	M1-M6
2	http://neuralnetworksanddeeplearning.com	http://neuralnetworksanddeeplearning.com/chap2.html	M3
3	https://www.analyticsvidhya.com/	https://www.analyticsvidhya.com/blog/2017/07/introduction-to-genetic-algorithm/	M5

Books and References:

Sr. No	Title	Authors	Publisher	Edition	Year
1	DevOps Tools from Practitioner's ViewPoint	Deepak Gaikwad, Viral Thakkar	Wiley	--	2016
2	The DevOps Adoption Playbook: A Guide to Adopting DevOps in a Multispeed IT Enterprise	Sharma S	Wiley	First	2017
3	DevOps for Dummies	Gene Kim, Kevin Behr, George Spafford	John Wiley & Sons	First	2014
4	Practical DevOps	Joakim Verona	Packt Publishing	First	2016

Online References:

Sr. No.	Website Name	URL	Modules Covered
1	www.javatpoint.com	https://www.javatpoint.com/devops	M1,M2,M3,
2	www.guru99.com	https://www.guru99.com/devops-tutorial.html	M4,M5,M6
3	www.tutorialspoint.com	https://www.tutorialspoint.com/devops_tutorials.htm	M1,M2,M3,M4,M5,M6
4	www.simplilearn.com	https://www.simplilearn.com/tutorials/devops-tutorial	M3,M4
5	www.edureka.co	https://www.edureka.co/blog/devops-tutorial	M1,M2,M3,M5
6	https://www.jenkins.io	https://www.jenkins.io/doc/tutorials/	M4
7	https://github.com	https://github.com/learn/devops	M3
8	www.dotnettricks.com	https://www.dotnettricks.com/learn/devops	M1,M2,M5,M6

B.E. Semester – VII
Choice Based Credit Grading Scheme with Holistic Student Development (CBCGS- H 2019)
TCET Autonomy Scheme (w.e.f. A.Y. 2022-23)

BE Information Technology							B.E (SEM : VII)		
Course Name: Software Testing and Quality Assurance							**Course Code:** PEC-IT 7022		
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: Software Engineering, Software Project Management

Course Objective: To understand & Apply testing techniques & to inculcate Testing skills in students for taking real time Software projects available in our society/industry and to come-up with the grass root innovation, can be helpful to all level of human beings.

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 software Methodology, testing definition & Goals of Software Testing.	L1,L2
2	Study & implement different software techniques & validation Activities.	L1,L2,L3,L4
3	Identify skills and personality of test management	L1,L2,L3,L4
4	Apply service oriented testing & Alpha Testing on	L1,L2,L3,L4,L5,L6
5	Apply Testing for Specialized environment	L1,L2,L3,L4,L5,L6
6	Design & Develop Quality Assurance in Software Testing	L1,L2,L3,L4,L5,L6

Detailed Syllabus:

Module No.	Topics	Hrs.	Cognitive levels of attainment as per Bloom's Taxonomy
1	**Testing Methodology** Introduction, Goals of Software Testing, Software Testing Definitions, Model for Software Testing, Effective Software Testing vs Exhaustive Software Testing, Software Failure Case Studies, Software Testing Terminology, Software Testing Life Cycle (STLC), Software Testing methodology, Verification and Validation, Verification of high level design & low level design , Validation of high level design & low level design.	7	L1,L2
2	**Testing Techniques** Dynamic Testing: Black Box testing, Boundary value analysis, equivalence class testing, state table based testing, cause-effect graphing based testing, error guessing. White box Testing Techniques: need, logic coverage criteria, basis path testing, graph matrices, loop testing, data flow testing, mutation testing. Static Testing. Validation Activities: Unit validation, Integration, Function, System, Acceptance Testing. Regression Testing: Progressive vs. Regressive, regression testing produces quality software, regression testability, objectives of regression testing, regression testing types, define problem, regression testing techniques.	8	L1,L2,L3,L4
3	**Managing the Test Process** Test preparation & execution: Test Scenario, Test Case Preparation, Test Execution, Defect Management, Requirement Traceability matrix Software Metrics: need, definition and classification of software matrices. Testing Metrics for Monitoring and Controlling the Testing Process: attributes and corresponding metrics, estimation model for testing effort, architectural design, information flow matrix used for testing, function point and test point analysis. Efficient Test Suite Management: minimizing the test suite and its benefits, test suite minimization problem, test suite prioritization its type, techniques and measuring effectiveness.	8	L1,L2,L3,,L4
4	**SOA Testing & Alpha Testing** What is SOA, What is Service, SOA Testing, Strategy for SOA Testing, SOA testing methods, Challenges in SOA testing, SOA Testing Tools, SOA Testing Use Cases.	7	L1,L2,L3,L4,L5,L6

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 (CBCGS)
Under TCET Autonomy

	What is alpha testing? Alpha testing process & Example. Automation and Testing Tools: need categorization, selection and cost in testing tool, guidelines for testing tools. Study of testing tools: Selenium Study of Automation tools : Bugzilla		
5	**Testing for Specialized environment** Agile Testing, Agile Testing Life Cycle, Testing in Scrum phases, Challenges in Agile Testing Scrum Testing Methodology: What is Scrum? Key Features of Scrum Methodology, Roles in Scrum, Scrum Artifacts, Ceremonies (Processes) in Scrum, Role of Tester in Scrum, Testing Activities in Scrum, Test Reporting. Testing Web based Systems: Web based system, web technology evaluation, traditional software and web based software, challenges in testing for web based software, testing web based testing	7	L1,L2,L3,L4,L5, L6
6	**Quality Assurance in Software Testing** Quality Assurance Process, Methods, Example : What is Quality, What is Assurance, How do we do Quality Assurance, What is Quality Control, Differences between SQA and Software Testing, Best practices for Quality Assurance, Quality Assurance Functions CMMI level, Test Maturity Model (TMM)	8	L1,L2,L3,L4,L5, L6
	Total Hours	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 can use different software techniques which they study in software technique model.

4. Students will do Installation of Testing tool and Automation tool (Any Open Source Tool).

5. Students will try to test any software using testing tool implement following points in their Mini Project ()
   a)   Study Software Testing Life Cycle (STLC) & prepared Reports on deliverables of STLC.
   b)   Verification & Validation of high level design & low level design
   c)   Study testing technique and implement with example
   d)   Design Testing Metrics for Monitoring and Controlling the Testing Process
   e)   What is alpha testing? Alpha testing process & Example
   f)   Study SOA Testing Tools & design SOA Testing Use Cases.
   g)   Implement Agile Testing, Agile Testing Life Cycle
   h)   Design test report using any Testing Tool and Automation tool
   i)   Design Quality Assurance Functions CMMI level

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

Capstone Project Hours Distribution:

Sr. No.	Work to be done	No. of Hours	Cognitive levels of attainment as per Bloom's Taxonomy
1	Study Problem definition, 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, L3, L4, L5
	Total Hours	30	

Books and References:

Sr. No	Title	Authors	Publisher	Edition	Year
1	Software Testing Principles and Practices	Naresh Chauhan	Oxford Higher Education	First	2010
2	Software Testing and quality assurance theory and practice	Kshirasagar Naik, PriyadarshiTripathy	Wiley Publication	First	2008
3	Effective Methods for Software Testing	Willam E. Perry	Wiley Publication	Third	2009
4	Software Testing Concepts and Tools	Nageswara Rao Pusuluri	Springer, 2011 (Unit III)	First	2011

Online References:

Sr. No.	Website Name	URL	Modules Covered
1	https://www.coursera.org https://www.guru99.com/	https://www.coursera.org/learn/introduction-software-testing https://www.guru99.com/software-testing.html	M1,M2,M3
2	https://www.coursera.org https://www.guru99.com/	https://www.coursera.org/learn/introduction-software-testing https://www.guru99.com/software-techniques.html	M1,M2,M3.M4
3	https://www.coursera.org https://www.guru99.com/	https://www.coursera.org/learn/introduction-software-testing https://www.guru99.com/ Managing the Test Process.html	M1,M2,M3
4	https://www.coursera.org https://www.guru99.com/	https://www.coursera.org/learn/introduction-software-testing https://www.guru99.com/ SOA Testing & Alpha Testing.html	M3,M4,M5
5	https://www.coursera.org https://www.guru99.com/	https://www.coursera.org/learn/introduction-software-testing https://www.guru99.com/	M3,M4,M5

		Testing for Specialized environment.html	
6	https://www.coursera.org https://www.guru99.com/	https://www.coursera.org/learn/introduction-software-testing https://www.guru99.com/ Quality Assurance in Software Testing.html	M4,M5,M6

B.E. Semester – VII
Choice Based Credit Grading Scheme with Holistic Student Development (CBCGS- H 2019)
TCET Autonomy Scheme (w.e.f. A.Y. 2022-23)

BE Information Technology							B.E. SEM: VII		
Course Name: Digital Signal and Image Processing **Professional Elective IV**							**Course Code:** PEC-IT 7023		
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**	**OR**	**TW**	**150**
3	-	2@	5	4	25	75	25	25	
IA: In-Semester Assessment- Paper Duration – 1.5 Hours ESE : End Semester Examination- Paper Duration - 3 Hours 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: Engineering Mathematics									

Course Objective: Course should be able to describe the formation of digital images in a computer, calculate the transform and also the inverse transform of a given image, perform image enhancement in spatial and frequency domain, describe image restoration models and techniques, and describe texture. Description Methods

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

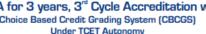| Sr. No.	Course Outcomes	Cognitive levels of attainment as per Bloom's Taxonomy
1	Demonstrate an understanding of basics of discrete time signal and system	L1, L2
2	Perform exploratory analysis of Discrete Fourier transform	L1,L2,L3
3	Learn image transform and image enhancement methods and apply it on given image	L1,L2,L3
4	Learn image segmentation and image representation methods and apply it on given image	L1,L2,L3,L4,L5
5	Learn and implement image compression and image morphological technique	L1,L2,L3,L4,L5
6	Apply knowledge to solve practical problems in digital image processing domain.	L1,L2,L3,L4,L5,L6

Detailed Syllabus:

Module No.	Topics	Hrs	Cognitive levels of attainment as per Bloom's Taxonomy
1	**Introduction to Discrete Time Signals & System** Discrete–Time Signals representation and Manipulation, Discrete–Time IIR and FIR Systems, Impulse Response, Transfer Function, Difference Equation, Frequency Domain and Time Domain Analysis of IIR filter and FIR filter, Correlation, Linear and Circular and Covolution Algortithm,	07	L1, L2
2	**Discrete Fourier Transform** DTFT, Frequency Domain Sampling, Properties of DFT, DIT-FFT algorithm, Spectral Analysis using FFT, Linear FIR filtering using FFT based Overlap Save and Overlap Add Method	07	L1,L2,L3
3	**Image Transforms and Enhancement** Image Transforms : Introduction to Unitary Transform, DFT, Properties of 2-D DFT, FFT, IFFT, Walsh transform, Hadamard Transform, Discrete Cosine Transform, Discrete Wavelet Transform, Image Enhancement: Gray Level Transformations, Histogram Processing, Spatial Filtering: Introduction, Smoothing and Sharpening Filters. Colour Image Enhancement	08	L1,L2,L3,L4,L5
4	**Image Segmentation and Representation** Detection of Discontinuities, Laplacian of Gaussian, Derivative of Gaussain, Canny Edge Detection, Thresholding in Hierarchical Data Structures, Border Tracing, Edge linking and Boundary Detection, Thresholding, Region Based Segmentation. Representation Schemes.	08	L1,L2,L3,L4,L5
5	**Image Data Compression and Image Morphology** Image Data Compression: Fundamentals, Redundancies: Coding, Interpixel, Psycho-visual, Error Free Compression, Lossy Image Compression : Lossy Predictive Coding, JPEG, MPEG, Subband Coding using Wavelet Transform, Vector Quantization, Morphological Image Processing: Introduction, Dilation, Erosion, Opening, Closing, Hit-or-Miss transformation, Basic Morphological Algorithms on binary images	09	L1,L2,L3,L4,L5
6	**Applications of Image Processing** Case Study on Digital Watermarking, Biometric Authentication (Face, Finger Print, Signature Recognition), Vehicle Number Plate Detection and Recognition, Object Detection using Correlation Principle, Person Tracking using DWT, Handwritten and Printed Character Recognition, Contend Based Image Retrieval, Text Compression.	06	L1,L2,L3,L4,L5, L6
	Total Hr.	45	

Books and References:

Sr. No	Title	Authors	Publisher	Edition	Year
1.	Introduction to Digital Signal Processing: Principles Algorithms Applications	J.G. Proakis	PHI	3rd	1996
2.	Digital Image Processing	R.C.Gonsales R.E.Woods	Pearson Education	3nd	2009
3.	Fundamentals of Image Processing	Anil K.Jain	PHI	2nd	2006

Online Recourses:

Sr. No.	Website Name	URL	Modules covered
1	https://tutorialpoints.com	https://www.tutorialspoint.com/digital_signal_processing/index.htm	M1,M2
2	https://tutorialpoints.com	https://www.tutorialspoint.com/dip/index.htm	M3,M4,M5,M6
3	https://nptel.ac.in	https://nptel.ac.in/courses/117/102/117102060/	M1,M2
4	ttps://nptel.ac.in	https://nptel.ac.in/courses/117/105/117105079/	M3,M4,M5,M6

Capstone Project Guide Lines

Title: A Case study of Image processing application

Sr. No	Work to be done	Hrs.	Cognitive levels of attainment as per Bloom's Taxonomy
1	Identification and Study of different types Image processing application (Problem Statement,. Ideal Problem Solution, Understanding and insight into the problem, Technical requirements)	2	L1, L2, L3
2	Project Title Identification as per literature survey	2	L1, L2, L3, L4
3	Finalize design requirements (hardware and software requirements for the algorithms and model implementation.)	4	L1, L2, L3, L4, L5
4	Data analysis and exploration(testing effectiveness and performance of the trained model.)	2	L1, L2, L3, L4
5	Data Preparation / Preprocessing / Augmentation (Data Reformatting (resizing images, modification to color channels, noise reduction, image enhancement) Data Cleaning Data Normalisation	2	L1, L2, L3, L4
6	Model Implementation	4	L1, L2, L3, L4
7	Training implemented model	4	L1, L2, L3
8	Evaluation of Model	2	L1, L2, L3, L4
9	Parameter tuning and Inference	2	L1, L2, L3, L4, L5, L6
10	Model Deployment – Technical feasibility study to be carried out for effective operations	2	L1, L2, L3, L4, L5, L6
11	Preparation of Report	4	L1, L2, L3, L4, L5, L6
	Total Hours	**30**	

B.E. Semester – VII
Choice Based Credit Grading Scheme with Holistic Student Development (CBCGS- H 2019)
TCET Autonomy Scheme (w.e.f. A.Y. 2022-23)

BE Information Technology							B.E (SEM : VII)		
Course Name: User Interaction Design							Course Code: PEC-IT 7024		
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)	Tot al
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: Software Engineering with Project Management									

Course Objective: To inculcate interactive design skills in students thereby stressing on importance of good interface design, understand the importance of human psychology as well as social and emotional aspect in designing good interfaces, learn the techniques of data gathering, establishing requirements, analysis, data interpretation and techniques for prototyping and evaluating user experiences and bring out the creativity in each student – build innovative applications that are usable, effective and efficient for intended users

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 importance of interaction design & identify good design & bad design for betterment of good quality system design.	L1,L2,L3
2	Identify fundamental aspect of interaction design is to develop a conceptual model & know importance of understanding users & their cognitive aspects.	L1,L2,L3,L4
3	Illustrate Process of Interaction Design and analyze practical issues in it.	L1,L2,L3,L4
4	Apply standard data Gathering techniques for data collection & Illustrate Task Description & Task Analysis	L1,L2,L3,L4,L5,L6
5	Apply design concepts to develop prototype & conceptual design for developing interactive software product.	L1,L2,L3,L4,L5,L6
6	Understand & Remember User centric approach, Design Principles & standards.	L1,L2,L3,L4

Detailed Syllabus:

Module No.	Topics	Hrs.	Cognitive levels of attainment as per Bloom's Taxonomy
1	**Introduction to Interaction Design**	7	L1,L2,L3
	What is interaction design?, Why is this important?, Good and Poor Design, User, understanding users' need, , The Process Of Interaction Design, what do professionals do in the ID business?, Goals of Interaction Design , Usability, Usability Goals, User Experience goals.		
2	**Understanding and Conceptualizing Interaction Cognitive aspects and Social, Emotional Interaction**	8	L1,L2,L3,L4
	Conceptualizing Interaction: Understanding the Problem Space and Conceptualizing Design, Conceptual Model, Interface Types **Cognitive aspects:** Social Interaction and the Emerging Social Phenomena, **Emotional Interaction:** Emotions and the User Experience, Expressive and Frustrating Interfaces, Persuasive Technologies.		
3	**The process of interaction design**	8	L1,L2,L3,,L4
	Introduction, Activities of Interaction design, Three key characteristics of the interaction design process **Practical issues:** Who are the users? What do we mean by "needs"?, How do you generate alternative designs?, How do you choose among alternative designs? **Lifecycle Models**: Life Cycle model of Interaction Design, Life Cycle model in Software Engineering, Life Cycle Model in HCI, How these models are interrelated?		
4	**Data Gathering, Establishing Requirements & Task Analysis**	7	L1,L2,L3,,L4,L5,L6
	Establishing Requirements, Five Key Issues, Techniques for Data Gathering, guidelines of Data Gathering, Data Interpretation, Analysis and Presentation, Task Description and Task Analysis		
5	**Prototyping, Construction & Conceptual Design**	8	L1,L2,L3,L4,L5,L6
	Prototyping & Construction: What is Prototype?, Why Prototype?, Low-fidelity, High-fidelity , Construction from design to implementation, **Conceptual Design:** From requirements to first Design, perspectives for developing conceptual model, Scenarios & prototypes in Conceptual model. **Physical Design**: Guidelines , Different kinds of widgets		
6	**User Centered Approach , Design rules and Industry standards**	7	L1,L2,L3,L4
	User Centered approaches to Interaction Design, Design principles, Principles to support Usability, Standards and Guidelines, Golden rules and Heuristics, ISO/IEC standards		
	Total Hours	**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 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 may design an app that helps you use your screens less or Design a better interface for existing systems.

4. Students can:

    I. Research the design causes of an increase in local crime,

    II. Find a local charity and redesign a donation portal for them,

    III. Write a case study about a time when you had to wait in line and how design could have sped up that process,

    IV. Design a website where UX designers can post design patterns and test results etc…

5. Each group along with the concerned faculty shall identify a potential problem statement for application or web designs, 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:

S. No.	Title	Authors	Publisher	Edition	Year
1.	Interaction Design	J. Preece, Y. Rogers and H. Sharp	John Wiley & Sons		2002
2.	Human Computer Interaction	Alan Dix, Janet Finlay, Gregory D Abowd, Russell Beale	Pearson	Third	2009
3.	About Face3: Essentials of Interaction design	Alan Cooper, Robert Reimann, David Cronin	Wiley publication.		2007
4.	An Introduction to GUI Design Principles and Techniques	Wilbert O. Galitz	Wiley Computer Publishing	Second	2002
5.	The Design of Everyday Things	Don Norman	Basic Books		2013

Online References:

Sr. No.	Website Name	URL	Modules Covered
1.	www.interaction-design.org	https://www.interaction-design.org/literature/topics/ui-design	M1
2.	www.interaction-design.org	https://www.interaction-design.org/literature/article/what-is-interaction-design	M2
3.	www.studocu.com	https://www.studocu.com/en/document/university-of-southampton/interaction-design/lecture-notes/lecture-notes-lectures-1-9-interaction-design/691675/view	M3
4.	ocw.mit.edu	https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-831-user-interface-design-and-implementation-spring-2011/lecture-notes/	M4
5.	www.toptal.com	https://www.toptal.com/designers/interactive/interaction-design-principles	M5
6.	theblog.adobe.com	https://theblog.adobe.com/15-rules-every-ux-designer-know/	M6

B.E. Semester – VII
Choice Based Credit Grading Scheme with Holistic Student Development (CBCGS- H 2019)
TCET Autonomy Scheme (w.e.f. A.Y. 2022-23)

B.E. (Information Technology)							B.E.SEM :VII		
Course Name: HealthCare Information System							**Course Code: PEC-IT 7025**		
Teaching Scheme (Program Specific)						**Examination Scheme (Formative/ Summative)**			
Modes of Teaching / Learning / Weightage						**Modes of Continuous Assessment / Evaluation**			
Hours Per Week					**Theory (100)**		**Practical/Oral/ Presentation**	**Term Work (25)**	**Total**
Theory	**Tutorial**	**Practical**	**Contact Hours**	**Credits**	**IA**	**ESE**	**OR**	**TW**	150
3	-	2@	5	4	25	75	25	25	
IA: In-Semester Exam- Paper Duration –1.5 Hours									
ESE : End Semester Exam- Paper Duration - **3 Hours**									
Total weightage of marks for continuous evaluation of Term work/Report: Formative (40%)									
@: Mini Project									
Timely Completion of Practical (40%) and Attendance/Learning Attitude (20%).									
Prerequisite: Enterprise Information System									
RBT: Revised Bloom's Taxonomy									

Course Objectives: The course intends to deliver the fundamentals of Public healthcare system, health systems in India, Hospital operation management, and medical service record, concepts of inventory control and purchase, IT healthcare initiatives by government, quality control and quality management.

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

Sr. No.	Course Objectives	Cognitive levels of attainment as
1	Understand basics of Public healthcare system	L1, L2
2	Learn health systems in India and IT healthcare initiatives by Government.	L1, L2
3	Analyze the Hospital operation management, Health services research & formalized managerial methods.	L1, L2, L3, L4
4	Understand medical service record, report and analyses Statistical Information.	L1, L2, L3, L4
5	Analyze the concepts of inventory control and purchase management.	L1, L2, L3, L4
6	Understand quality control and quality management with accreditations	L1,L2,L3,L4

Detailed Syllabus:

Module No.	Topics	Hrs.	Cognitive levels of attainment as per Bloom's Taxonomy
	Prerequisite		
	Enterprise Information System, EMR Platforms		
1	**Introduction to Public Health**	7	L1,L2
	Evolution of Public Health. Important Public Health Acts, Health problems of developed and developing countries, Health problems in India, Environment and Health. Community health applications and devices.		
2	**Health Systems in India**	9	L1,L2
	Health planning in India including various committees and National Health Policy and Health Goals set from time to time. Organised sector with reference to Centre, State, District and Block level structures and local bodies and Panchayati Raj Organisation and functions of community health centres and Primary Health Centres (PHCs). Health Manpower, Primary Health care and concept, Alternative systems of medicine, like Ayurveda, Homeopathy, etc. Holistic Approach Non- Governmental Organisations (NGOs) and Private Voluntary Organisations (PVOs). Unorganized Sector. India's National Health Portal. IT healthcare initiatives by government.		
3	**Hospital Operation Management**	8	L1, L2, L3, L4
	Revenue cycle management in HMIS ,Epidemiological basis for healthcare management. Management development-towards development of professional management of Indian Hospitals. Management of Indian Hospitals, challenges & strategies. Modern Techniques of hospital management. Operation concept- use of models. Health services research & formalized managerial methods,		
4	**Medical Record Science**	9	L1,L2,L3,L4
	Definition and types of medical record, Importance of medical record, Flow chart of function, Statutory requirements of maintenance, coding, indexing and filing, Computerization of record, Report and returns by the record department, Statistical information and ICD.		
5	**Inventory Control & Purchase Management**	7	L1,L2,L3,L4
	ERP systems in hospitals Medecine Inventory Control & Purchase Management-meaning & significance. Purchasing & procurement. Principles of sourcing, purchase methods & procedures, legal aspects of purchasing. Reference to Contract Act, Sale of Goods Act, Drug Control Act in respect to purchase activities. Import substitution. Drug formulary with alerts, subscriptions on food allergy duplication, dosage and diagnostic test results e.g. CIMS		
6	**Quality Control & Quality management**	5	L1,L2,L3,L4
	Principles & methods. Principles of storage & stores accounting- types of storage care & preservation of materials & equipment in inventory control. Distribution management (logistics Management) - distribution of materials to various departments & auxiliary services. Exceptional management needs in Healthcare Units- Management of Blood Bank, Donated Organs, Morgues, and Dispensaries, NABH,NABL and JCI accreditations.		
	Total Hours	45	

Mini 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 in areas of Electronic Medical/Health Records, Healthcare mobile devices, Diagnostic equipment, Business Process re- engineering and automation, intranet/internet portal for healthcare workers ,support staff, doctors ,patients and suppliers, Operations Management, Medical Administration management, Balance score card and Dash Boards on Healthcare metrics (KPIs and CQIs)	4	L1,L2
2	Project Title finalization and development of Modules	2	L1,L2
3	Design methodology and tools for implementation ER model, dimensional modelling and Data vault modelling, datawarehorse, data lake, HMIS,ERP,EMR PLATFORMS Data Visualization tools(Tableau,Qlik,Qdi),ETL Tools etc	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, measurement infrastructure, for people process and technology	2	L1,L2,L3,L4
9	Result validation, Healthcare metrics (KPIs and CQIs)	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	Healthcare Information Technology	Dr. Kathleen McCormick, Dr. Brian Gugetry, Dr. John E. Mattison	McGraw Hill	Fourth Edition	2018
2	Introduction to Healthcare IT	Mark Ciampa and Mark Revels	Cengage Learning	Third Edition	2013
3	Health Informatics: Practical Guide for Healthcare and Information Technology Professionals	Robert E. Hoyt	Informatics Education	Fifth Edition	2012
4	The Book on Healthcare IT: What you need to know about HIPAA, Hospital IT, and Healthcare Information	James Scott	New Renaissance Corporation	Third Edition	2014

Online References:

Sr. No.	Website Name	URL	Modules Covered
1	Coursera.org	https://www.coursera.org/learn/healthcar e-it	M1, M2, M3, M4, M5, M6
2	Coursera.org	https://www.coursera.org/specializations /health-informatics	M1, M2, M3, M4, M5, M6
3	Edx.org	https://www.edx.org/course/health-informatics-the-cutting-edge	M1, M2, M3, M4, M5, M6
4	NPTEL	https://onlinecourses.nptel.ac.in/noc19_ mg50/preview	M1, M2, M3, M4, M5, M6

B.E. Semester – VII
Choice Based Credit Grading Scheme with Holistic Student Development (CBCGS- H 2019)
TCET Autonomy Scheme (w.e.f. A.Y. 2022-23)

B.E. (Information Technology)							B.E. Open Elective SEM : VII		
Course Name : Management Information System							**Course Code:** OEC -IT 7011		
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									
The weightage of marks for continuous evaluation of Term work/Report: Formative (40%), Timely completion of practical (40%) and Attendance / Learning Attitude (20%)									
Prerequisite: Database Design and Management									

Course Objective: The course intends to deliver the role of Management in Information Systems to understand the impact of these systems within an Organization to improve business performance and decision making. It analyzes typical functional information systems, principal tools and technologies for accessing information from databases & interpreting Ethical issues & Privacy for the same.

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	Explain how information systems Transform Business	L1, L2
2	Understand about Data and Knowledge Management	L1, L2, L3
3	Analyze the Ethical issues and Privacy in Information Systems	L1, L2, L3, L4
4	Understand the principal tools and technologies for accessing information from databases to improve business performance and decision making	L1, L2, L3
5	Analyze the types of systems used for enterprise-wide knowledge management and how they provide value for businesses	L1, L2, L3, L4
6	Analyze the impact of information systems have on an organization	L1, L2, L3, L4

Detailed Syllabus:

Module No.	Topics	Hrs	Cognitive levels of attainment as per Bloom's Taxonomy
1	**Introduction To Information Systems (IS)**	6	L1, L2
	Computer Based Information Systems, Impact of IT on organizations, Importance of IS to Society. Organizational Strategy, Competitive Advantages and IS		
2	**Data and Knowledge Management**	9	L1, L2, L3
	Database Approach, Big Data, Data warehouse and Data Marts, Knowledge Management Business intelligence (BI): Managers and Decision Making, BI for Data analysis and Presenting Results		
3	**Ethical issues and Privacy**	8	L1, L2, L3, L4
	Information Security. Threat to IS, and Security Controls		
4	**Social Computing (SC)**	7	L1, L2, L3
	Web 2.0 and 3.0, SC in business-shopping, Marketing, Operational and Analytic CRM, E-business and E-commerce – B2B B2C. Mobile commerce.		
5	**Wired and Wireless Technology**	7	L1, L2, L3, L4
	Computer Networks Wired and Wireless Technology, Pervasive computing, Cloud computing model.		
6	**Information System within Organization**	8	L1, L2, L3, L4
	Transaction Processing Systems, Functional Area Information System, ERP and ERP support of Business Process. Acquiring Information Systems and Applications: Various System development life cycle models		
	Total Hours	45	

Books and References:

Sr. No.	Title	Authors	Publisher	Edition	Year
1.	Management Information Systems	Kelly Rainer, Brad Prince	Wiley	Sixth Edition	2011
2.	Management Information Systems	K.C. Laudon and J.P. Laudon	Prentice Hall	Tenth Edition	2007
3.	Managing Information Systems: Strategy and Organization	D. Boddy, A. Boonstra	Prentice Hall	Tenth Edition	2008

Online References:

Sr. No	Website Name	URL	Modules Covered
1	https://www.tutorialspoint.com/index.htm	https://www.tutorialspoint.com/management_information_system/	M1
2	https://www.tutorialspoint.com/index.htm	https://www.tutorialspoint.com/management_information_system/informati on_need_objective.htm	M2
3	https://www.tutorialspoint.com/index.htm	https://www.tutorialspoint.com/management_information_system/mis_secu rity_and_ethical_issues.htm	M3
4	https://www.tutorialspoint.com/index.htm	https://www.tutorialspoint.com/management_information_system/system_d evelopment_life_cycle.htm	M4
5	https://pressbooks.com/	https://bus206.pressbooks.com/chapter/chapter-13-future-trends-in-information-systems/	M5
6.	https://www.tutorialspoint.com/index.htm	https://www.tutorialspoint.com/management_information_system/business _continuity_planning.htm	M6

B.E. Semester – VII
Choice Based Credit Grading Scheme with Holistic Student Development (CBCGS- H 2019)
TCET Autonomy Scheme (w.e.f. A.Y. 2022-23)

B.E. (Information Technology)							B.E. Open Elective (SEM : VII)			
Course Name: Human Resource Management							**Course Code: OEC IT- 7012**			
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**	**Credit**	**IA**	**ESE**	**PR**	**TW**		**100**
3	-	-	3	3	25	75	-	-	-	
IA: In-Semester Assessment - Paper Duration – 1.5 Hours **ESE: End Semester Examination - Paper Duration - 3 Hours** **The weightage of marks for continuous evaluation of Term work/Report:** Formative (40%), Timely completion of practical (40%) and Attendance / Learning Attitude (20%)										
Pre-requisite: The course does not have any pre-requisites.										

Course Objective:

The course intends to deliver basic concept, techniques and practices of the human resource Management. The course also gives opportunity of learning Human resource management (HRM) processes, related with the functions, and challenges in the emerging perspective of today's organizations, also helps student to acquaint the importance of inter-personal & inter-group behavioral skills in an organizational setting required for future stable engineers, leaders and managers.

Course Outcomes: Upon Completion of Course student will be able to:

SN	Course Outcomes	Cognitive levels of attainment
1	Understand the concepts, aspects, techniques and practices of the human resource management.	L1,L2
2	Understand the Human resource management (HRM) processes, functions, changes and challenges in today's emerging organizational perspective.	L1,L2
3	Gain knowledge about the latest developments and trends in HRM.	L1,L2,L3
4	Understand the Training and development process in HRM	L1,L2,L3
5	Applying Leadership and Decision Making qualities	L1,L2,L3,L4
6	Apply the knowledge of behavioral skills learnt and integrate it with in inter personal and Inter group environment emerging as future stable engineers and managers.	L1,L2,L3,L4

Detailed Syllabus:

Module No.	Topics	Hrs.	Cognitive levels of attainment
1	**Human Resource Management development**	06	L1,L2
	Human Resource Management- Concept, Scope and Importance, Interdisciplinary Approach Relationship with other Sciences, Competencies of HR Manager, HRM functions.		
	Human resource development (HRD): changing role of HRM – Human resource Planning, Technological change, Restructuring and rightsizing, Empowerment, TQM, Managing ethical issues.		
2	**Organizational Behaviour (OB)**	07	L1,L2
	Introduction to OB Origin, Nature and Scope of Organizational Behaviour, Relevance to Organizational Effectiveness and Contemporary issues.		
	Personality: Meaning and Determinants of Personality, Personality development, Personality Types, Assessment of Personality Traits for Increasing Self Awareness. **Perception**: Attitude and Value, Effect of perception on Individual Decision-making, Attitude and Behaviour.		
	Motivation: Theories of Motivation and their Applications for Behavioural Change (Maslow, Herzberg, McGregor).		
	Group Behaviour and Group Dynamics: Work groups formal and informal groups and stages of group development, Team Effectiveness: High performing teams, Team Roles, cross functional and self-directed team.		
	Case study.		
3	**Organizational Structure & Design**	08	L1,L2,L3
	Structure, size, technology, Environment of organization; Organizational Roles & conflicts: Concept of roles; role dynamics; role conflicts and stress.		
	Leadership: Concepts and skills of leadership, Leadership and managerial roles, Leadership styles and contemporary issues in leadership.		
	Power and Politics: Sources and uses of power; Politics at workplace, Tactics and strategies.		
4	**Human resource Planning**	08	L1,L2,L3

	Recruitment and Selection process, Job-enrichment, Empowerment - Job-Satisfaction, employee morale. **Performance Appraisal Systems**: Traditional & modern methods, Performance Counseling, Career Planning. Training & Development: Identification of Training Needs, Training Methods.			
5	**Emerging Trends in HR**	07	L1,L2,L3,L4
	Organizational development; Business Process Re-engineering (BPR), BPR as a tool for organizational development, managing processes & transformation in HR. Organizational Change, Culture, Environment. **Cross Cultural Leadership and Decision Making**: Cross Cultural Communication and diversity at work, Causes of diversity, managing diversity with special reference to handicapped, women and ageing people, intra company cultural difference in employee motivation.		
6	**HR&MS**	9	L1,L2,L3,L4
	HR & MIS: Need, purpose, objective and role of information system in HR, Applications in HRD in various industries (e.g. manufacturing R&D, Public Transport, Hospitals, Hotels and service industries. **Strategic HRM**: Role of Strategic HRM in the modern business world, Concept of Strategy, Strategic Management Process, Approaches to Strategic Decision Making; Strategic Intent – Corporate Mission, Vision, Objectives and Goals.		
	Labor Laws & Industrial Relations: Evolution of IR, IR issues in organizations, Overview of Labor Laws in India; Industrial Disputes Act, Trade Unions Act, Shops and Establishments Act.		
	Total	45	

Books & References:

Sr. No	Title	Authors	Publisher	Edition	Year
1	Organizational Behavior	Stephen Robbins,	Excel publishing	16th Ed	2013
2	Human Resource Management	V S P Rao,	Excel publishing	3rd Ed	2010
3	Human resource management	Aswathapa,	Text & cases	6th Ed,	2011
4	Dynamics of Industrial Relations in India	C. B. Mamoria and S V Gankar,	Himalaya Publishing,	15th Ed	2015
5	Essentials of Human Resource management and Industrial relations	P. Subba Rao,	Himalaya Publishing,	5th Ed	2013
6	Management & Organizational Behavior	Laurie Mullins	Himalaya Publishing,	Latest Ed	2016

Online references:

Sr. No	Website Name	URL	Modules Covered
1	NPTEL	https://nptel.ac.in/courses/110105069/	M1,M2,M3
2	COURSE ERA	https://www.coursera.org/specializations/human- resource-management	M4,M5
3	SWAYAM	https://swayam.gov.in/nd1_noc19_mg51/preview	M1,M2,M5,M6

B.E. Semester – VII
Choice Based Credit Grading Scheme with Holistic Student Development (CBCGS- H 2019)
TCET Autonomy Scheme (w.e.f. A.Y. 2022-23)

B.E. (Information Technology)							B.E. Open Elective (SEM : VII)		
Course Name: Design Thinking and Problem-Solving							**Course Code: OEC IT- 7013**		
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 Hours0**									
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: Not Required									

Course Objective: To inculcate interdisciplinary engineering skills in students for taking real time engineering problem available in our society/industry and to come-up with the grass root innovation, can be helpful to all level of human beings.
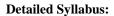
Course Outcomes: Upon completion of the course students will be able to:

Sr. No.	Course Outcomes	Cognitive levels of attainment as per Bloom's Taxonomy
1	Understand the importance of Design Thinking and Apply design thinking for product development	L1,L2
2	Evaluate the quality of your information and your emotions; keep thinking Straight and use design thinking tools	L1,L2,L3,L4
3	Identify skills and personality traits of successful problem solving.	L1,L2,L3,L4
4	Apply standard problem-solving heuristics to aid in problem solving.	L1,L2,L3,L4,L5,L6
5	Apply design thinking to improve on existing products in IT	L1,L2,L3,L4,L5,L6
6	Formulate and successfully communicate the solutions to problems.	L1,L2,L3,L4,L5,L6

Detailed Syllabus:

Module No.	Topics	Hrs.	Cognitive levels of attainment as per Bloom's Taxonomy
1	**Design Thinking Introduction, Team Formation, Documentation and Canvas** Introduction, Need of Design Thinking, Traditional Problem Solving versus Design Thinking, phases of Design Thinking, Tools for Design Thinking, Relevance of Design and Design Thinking in Engineering, Team Formation, Documentation and Canvas Team Building Domain Selection (Society/Industry project), Log Books-need, types of log book, preparation of log book, Importance of Documentation, Strategy Design	7	L1,L2
2	**Design Thinking Exercise** Formation of Team and aspects for the selection, Domain selection, Observation exercise, Design activities through Canvas, Brainstorming for the problem, Users Interview conduction, generation of records via logbooks	8	L1,L2,L3,L4
3	**Problem Solving Skills Introduction** Developing logical thinking. Introduction to Problem Solving in Computer Science domain, Errors in reasoning; verbal reasoning; analogy problems lateral thinking, Problem Solving Techniques Deductive and hypothetical reasoning; computational problem solving; generating, implementing, and evaluating solutions; interpersonal problem solving, Group Activities based assignments related to problem solving skills will be given for better understanding and development of problem solving skills	8	L1,L2,L3,,L4
4	**Tools for Design Thinking** Theory and practice in Design thinking – Exploring work of Designers across globe – MVP or Prototyping ,Real-Time design interaction capture and analysis – Enabling efficient collaboration in digital space – Empathy for design – Collaboration in distributed Design	7	L1,L2,L3,L4,L5,L6
5	**Design Thinking in IT** Design Thinking to Business Process modeling – Agile in Virtual collaboration environment – Scenario based Prototyping	7	L1,L2,L3,L4,L5,L6
6	**Design Thinking For strategic innovations** DT For strategic innovations – Growth – Story telling - Predictability – Strategic Foresight - Change – Sense Making - Maintenance Relevance – Value redefinition - Extreme Competition – experience design - Standardization – Humanization - Creative Culture – Rapid prototyping, Strategy and Organization – Business Model design.	8	L1,L2,L3,L4,L5,L6
	Total Hours	**45**	

Textbook and Reference Book

Sr. No	Title	Authors	Publisher	Edition	Year
1	Strategies for Creative Problem Solving	H. S. Fogler and S. E. LeBlanc	Pearson,	Second	2008
2	Problem Solving & Comprehension	A. Whimbey and J. Lochhead	Lawrence Erlbaum, Mahwah,	Sixth	1999
3	The Design of Business: Why Design Thinking is the Next Competitive Advantage	Roger Martin	Harvard Business Press	First	2009
4	Design Thinking: Understand – Improve – Apply	Hasso Plattner, Christoph Meinel and Larry Leifer	Springer, 2011 (Unit III)	First	2011
5	Design Thinking for Strategic Innovation: What They Can't Teach You at Business or Design School. (Unit IV).	Idris Mootee	John Wiley & Sons 2013	First	2013
6	Effective Problem Solving	M. Levine	Prentice Hall	Second	1994

Online References:

Sr. No.	Website Name	URL	Modules Covered
1	https://www.coursera.org	https://www.coursera.org/learn/uva-darden-design-thinkinginnovation	M1,M2,M3,
2	http://www.cs.odu.edu	http://www.cs.odu.edu/~cs381/cs381content/problem_solving/problem_solving.html	M4,M5,M6
3	https://www.cs.vt.edu	https://www.cs.vt.edu/undergraduate/courses/CS2104	M1,M2,M3,M4,M5,M6
4	https://ryanstutorials.net	https://ryanstutorials.net/problem-solving-skills/	M3,M4
5	https://dschool.stanford.edu	https://dschool.stanford.edu/.../designresources/.../ModeGuideBOOTCAMP2010L.pdf	M1,M2,M3,M5
6	https://dschool.stanford.edu	https://dschool.stanford.edu/use-our-methods/	M4,M5,M6
7	https://www.interaction-design.org	https://www.interaction-design.org/literature/article/5-stages-in-the-design-thinking-process	M1,M2,M5,M6
8	http://www.creativityatwork.com	http://www.creativityatwork.com/design-thinking-strategy-for-innovation/ 49	M1,M2,M5,M6
9	https://www.nngroup.com	https://www.nngroup.com/articles/design-thinking/	M1,M2,M3,M4,M6
10	www.designthinkingformobility.org	www.designthinkingformobility.org/wp-content/.../10/NapkinPitch_Worksheet.pdf	M4,M5,M6

B.E. Semester – VII
Choice Based Credit Grading Scheme with Holistic Student Development (CBCGS- H 2019)
TCET Autonomy Scheme (w.e.f. A.Y. 2022-23)

B.E. (Information Technology)		B.E. Open Elective (SEM: VII)					
Course Name: Disaster Management and Mitigation Measures		**Course Code: OEC IT- 7014**					
Contact Hours Per Week: 03		**Credit:** 03					
Teaching Scheme (Program Specific)		**Examination Scheme Formative/Summative)**					
Modes of Teaching / Learning / Weightage		**Modes of Continuous Assessment / Evaluation**					
Hours Per Week					**Theory (100)**		**Practical/Oral (25)**	**Term Work (25)**	**Total**
Theory	Tutorial	Practical	Contact Hours	Credits	IA	ESE	PR	TW	
3	-	-	3	3	25	75	-	-	**100**
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: Environmental studies									

Course Objectives:

Main objective of the subject is to understand causes of different types of disasters, mitigation /rehabilitation measures and existing government policies and agencies.

Course Outcomes:

SN	Course Outcomes	Cognitive levels as per bloom's taxonomy
1	Get to know natural as well as manmade disaster and their extent and possible effects on the economy.	L1, L2,L3
2	Plan of national importance structures based upon the previous history.	L1, L2,L3
3	Get acquainted with government policies, acts and various organizational structure associated	L1, L2,L3
4	Get to know the simple do's and don'ts in such extreme events and act accordingly.	L1, L2,L3

Detailed Syllabus:

Module No.	Topics	Hrs.	Cognitive levels as per bloom's taxonomy
1	**Introduction**		
	Definition of Disaster, hazard, global and Indian scenario, general perspective, importance of study in human life, Direct and indirect effects of disasters, long term effects of disasters. Introduction to global warming and climate change	**04**	L1, L2,L3

2	**Natural Disaster and Manmade disasters**		
	Natural Disaster: Meaning and nature of natural disaster, Flood, Flash flood, drought, cloud burst, Earthquake, Landslides, Avalanches, Volcanic eruptions, Mudflow, Cyclone, Storm, Storm Surge, climate change, global warming, sea level rise, ozone depletion, Manmade Disasters: Chemical, Industrial, Nuclear and Fire Hazards. Role of growing population and subsequent industrialization, urbanization and changing lifestyle of human beings in frequent occurrences of manmade disasters	09	L1, L2,L3
3	**Disaster Management, Policy and Administration**		
	Disaster management: meaning, concept, importance, objective of disaster management policy, disaster risks in India, Paradigm shift in disaster management **Policy and administration:** Importance and principles of disaster management policies, command and co-ordination of in disaster management, rescue operations-how to start with and how to proceed in due course of time, study of flowchart showing the entire process.	09	L1, L2,L3
4	**Institutional Framework for Disaster Management in India**		
	Importance of public awareness, Preparation and execution of emergency management program. Scope and responsibilities of National Institute of Disaster Management (NIDM) and National disaster management authority (NDMA) in India. Methods and measures to avoid disasters, Management of casualties, set up of Emergency facilities, importance of effective communication amongst different agencies in such situations. Use of Internet and software for effective disaster management. Applications of GIS, Remote sensing and GPS in this regard.	07	L1, L2,L3
5	**Financing Relief Measures**		
	Ways to raise finance for relief expenditure, role of government agencies and NGO's in this process, Legal aspects related to finance raising as well as overall management of disasters. Various NGO's and the works they have carried out in the past on the occurrence of various disasters, Ways to approach these teams. International relief aid agencies and their role in extreme events	10	L1, L2,L3
6	**Preventive and Mitigation Measures**		
	Pre-disaster, during disaster and post-disaster measures in some events in general. Structural mapping: Risk mapping, assessment and analysis, sea walls and embankments, Bio shield, shelters, early warning and communication. Non Structural Mitigation: Community based disaster preparedness, risk transfer and risk financing, capacity development and training, awareness and education, contingency plans. Do's and don'ts in case of disasters and effective implementation of relief aids.	06	L1, L2,L3
	Total Hours	45	

Books & References:

SN	Title	Authors	Publisher	Edition	Year
1	Disaster Management	Harsh K.Gupta	Universities Press Publications	1st	2003
2	Disaster Management: An Appraisal of Institutional Mechanisms in India	O.S.Dagur	Centre for land warfare studies	1st	2011
3	Introduction to International Disaster Management	Damon Copolla	Butterworth Heinemann Elsevier Publications	1st	2006
4	Disaster Management Handbook	Jack Pinkowski	CRC Press Taylor and Francis group	1st	2008
5	Disaster management & rehabilitation	Rajdeep Dasgupta	Mittal Publications	1st	2007
6	Natural Hazards and Disaster Management, Vulnerability and Mitigation	R B Singh	Rawat Publications	1st	2006
7	Concepts and Techniques of GIS	C.P. Lo Albert, K.W. Yonng	Prentice Hall (India) Publications.	1st	2006

B.E. Semester – VII
Choice Based Credit Grading Scheme with Holistic Student Development (CBCGS- H 2019)
TCET Autonomy Scheme (w.e.f. A.Y. 2022-23)

B.E. (Information Technology)							B.E. Open Elective SEM: VII		
Course Name: Research Methodology							**Course Code:** OEC IT- 7015		
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**									
The weightage of marks for continuous evaluation of Term work/Report: Formative (40%), Timely completion of practical (40%) and Attendance / Learning Attitude (20%)									
Prerequisite: Basics of Statistics									

Course Objective: The objective of this course is to make students understand research problem formulation and analyze research related information.

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

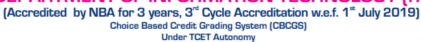| S. No.	Course Outcomes	Cognitive levels of attainment as per Bloom's Taxonomy
1	Understand research problem formulation.	L1, L2, L3
2	Analyze research related information	L1, L2, L3, L4
3	Follow research ethics	L1, L2, L3
4	Understand that today's world is controlled by Computer, Information Technology, but tomorrow world will be ruled by ideas, concept, and creativity.	L1, L2, L3
5	Understanding that when IPR would take such important place in growth of individuals & nation, it is needless to emphasis the need of information about Intellectual Property Right to be promoted among students in general & engineering in particular.	L1, L2, L3
6	Understand that IPR protection provides an incentive to inventors for further research work and investment in R & D, which leads to creation of new and better products, and in turn brings about, economic growth and social benefits.	L1, L2, L3

Detailed Syllabus:

Module No.	Topics	Hrs.	Cognitive levels as per bloom's Taxonomy
1	Foundations of Research: Meaning, Objectives, Motivation, Utility. Concept of theory, empiricism, deductive and inductive theory. Characteristics of scientific method – Understanding the language of research – Concept, Construct, Definition, Variable. Research Process	5	L1, L2, L3
2	Problem Identification & Formulation – Research Question – Investigation Question – Measurement Issues – Hypothesis – Qualities of a good Hypothesis –Null Hypothesis & Alternative Hypothesis. Hypothesis Testing – Logic & Importance	6	L1, L2, L3, L4
3	Research Design: Concept and Importance in Research – Features of a good research design – Exploratory Research Design – concept, types and uses, Descriptive Research Designs – concept, types and uses. Experimental Design: Concept of Independent & Dependent variables	9	L1, L2, L3
4	Qualitative and Quantitative Research: Qualitative research – Quantitative research – Concept of measurement, causality, generalization, replication. Merging the two approaches.	7	L1, L2, L3
5	Interpretation of Data and Paper Writing – Layout of a Research Paper, Journals in Computer Science, Impact factor of Journals, When and where to publish ? Ethical issues related to publishing, Plagiarism and Self-Plagiarism.	9	L1, L2, L3
6	Use of tools / techniques for Research: methods to search required information effectively, Reference Management Software like Zotero/Mendeley, Software for paper formatting like LaTeX/MS Office, Software for detection of Plagiarism	8	L1, L2, L3
	Total Hours	45	

Text Book Reference:

S. No.	Title	Authors	Publisher	Edition	Year
1	Research methodology: an introduction for science & engineering students	Stuart Melville and Wayne Goddard	Juta Academic	1st edition	1996
2	Research Methodology: An Introduction	Wayne Goddard and Stuart Melville	Juta and Company Ltd	2nd edition	2004
3	Research Methodology: A Step by Step Guide for beginners	Ranjit Kumar	SAGE Publications Ltd	3rd edition	2014

Online References:

Sr. No.	Website Name	URL	Modules Covered
1	www.nptel.ac.in	https://nptel.ac.in/courses/121/106/121106007/	M1, M2, M3, M4, M5, M6
2	www.courseera.org	https://www.coursera.org/browse/physical-science-and-engineering/research-methods	M1, M2, M3, M4, M5, M6
3	www.udemy.com	https://www.udemy.com/course/research-methods/	M1, M2, M3, M4, M5, M6

B.E. Semester – VII

Choice Based Credit Grading Scheme with Holistic Student Development (CBCGS- H 2019)
TCET Autonomy Scheme (w.e.f. A.Y. 2022-23)

B.E. (Information Technology)					B.E. Open Elective SEM: VII				
Course Name: Operation Research					**Course Code: OEC IT- 7016**				
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**	**ISA**	**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 / Learning Attitude (20%)									
Prerequisite: Engineering Mathematics									

Course Objectives: Course intend to deliver the optimization techniques so that student should be able to optimize any engineering product or process.

Course Outcome:

SN	Course Outcomes	Cognitive levels as per bloom's Taxonomy
1	Understand the theoretical workings of the simplex method, the relationship between a linear program and its dual, including strong duality and complementary slackness.	L1, L2, L3, L4
2	Perform sensitivity analysis to determine the direction and magnitude of change of a model's optimal solution as the data change	L1, L2, L3, L4
3	Solve specialized linear programming problems like the transportation and assignment problems, solve network models like the shortest path, minimum spanning tree, and maximum flow problems	L1, L2, L3, L4
4	Understand the applications of integer programming and a queuing model and compute important performance measures	L1, L2, L3, L4
5	To apply conflict between two players	L1, L2, L3, L4
6	To apply EOQ model in inventory	L1, L2, L3, L4

Detailed Syllabus:

Module No.	Topics	Hrs.	Cognitive levels as per bloom's Taxonomy
	Introduction to Operations Research		
1	Introduction, , Structure of the Mathematical Model, Limitations of Operations Research **Linear Programming**: Introduction, Linear Programming Problem, Requirements of LPP, Mathematical Formulation of LPP, Graphical method, Simplex Method Penalty Cost Method or Big M- method, Two Phase Method, Revised simplex method, **Duality**, Primal – Dual construction, Symmetric and Asymmetric Dual, Weak Duality Theorem, Complimentary Slackness Theorem, Main Duality Theorem, Dual Simplex Method, Sensitivity Analysis **Transportation Problem**: Formulation, solution, unbalanced Transportation problem. Finding basic feasible solutions – Northwest corner rule, least cost method and Vogel's approximation method. Optimality test: the stepping stone method and MODI method **Assignment Problem** Introduction, Mathematical Formulation of the Problem, Hungarian Method Algorithm, Processing of n Jobs Through Two Machines and m Machines, Graphical Method of Two Jobs m Machines Problem Routing Problem, Travelling Salesman Problem **Integer Programming Problem** Introduction, Types of Integer Programming Problems, Gomory's cutting plane Algorithm, Branch and Bound Technique. Introduction to Decomposition algorithms.	11	L1, L2, L3, L4
2	**Queuing models**: Queuing systems and structures, single server and multi-server models, Poisson input, exponential service, constant rate service, finite and infinite population	05	L1, L2, L3, L4
3	**Simulation:** Introduction, Methodology of Simulation, Basic Concepts, Simulation Procedure, Application of Simulation Monte-Carlo Method: Introduction, Monte-Carlo Simulation, Applications of Simulation, Advantages of Simulation, Limitations of Simulation	05	L1, L2, L3, L4
4	**Dynamic programming.** Characteristics of dynamic programming. Dynamic programming approach for Priority Management employment smoothening, capital budgeting, Stage Coach/Shortest Path, cargo loading and Reliability problems.	6	L1, L2, L3, L4
5	**Game Theory.** Competitive games, rectangular game, saddle point, minimax (maximin) method of optimal strategies, value of the game. Solution of games with saddle points, dominance principle. Rectangular games without saddle point – mixed strategy for 2 X 2 games.	10	L1, L2, L3, L4
6	**Inventory Models** Classical EOQ Models, EOQ Model with Price Breaks, EOQ with Shortage, Probabilistic EOQ Model,	08	L1, L2, L3, L4
	Total Hours	45	

Books and References:

SN	Title	Authors	Publisher	Edition	Year
1	Operations Research - An Introduction	Taha, H.A.	Prentice Hall,	7th Edition,	2002-
2	Operations Research: Principles and Practice	Ravindran, A, Phillips	John Willey and Sons	2nd Edition -	2009
3	Introduction to Operations Research	Hiller, F. S. and Liebermann	McGraw Hill	-	-
4	Operations Research	S. D. Sharma	KedarNath Ram Nath- Meerut	-	-

B.E. Semester – VII
Choice Based Credit Grading Scheme with Holistic Student Development (CBCGS- H 2019)
TCET Autonomy Scheme (w.e.f. A.Y. 2022-23)

BE Information Technology							B.E (SEM : VII)		
Course Name: Finance Management							**Course Code:** HSMC- IT701		
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** **The weightage of marks for continuous evaluation of Term work/Report:** Formative (40%), Timely completion of practical (40%) and Attendance / Learning Attitude (20%)									
Prerequisite: Financial Accounting and Management									

Course Objective: The course intends to give an understanding of Indian financial system, instruments and market. The course also aims to deliver basic concepts of value of money, returns and risks, corporate finance, working capital and its management.

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 Indian finance system and corporate finance	L1, L2
2	Take investment, finance as well as dividend decisions	L1, L2, L3, L4
3	Understand concepts of Returns and Risks	L1, L2, L3, L4
4	Demonstrate Financial Ratio Analysis	L1, L2, L3, L4, L5
5	Analyse the sources of Finance	L1,L2,L3,L4,L5,L6
6	Formulate the Dividend Policy.	L1,L2,L3,L4,L5,L6

Detailed Syllabus:

Module No.	Topics	Hrs.	Cognitive levels of attainment as per Bloom's Taxonomy
1	**Overview of Indian Financial System** Characteristics, Components and Functions of Financial System Financial Instruments: Meaning, Characteristics and Classification of Basic Financial Instruments Equity Shares, Preference Shares, Bonds-Debentures Certificates of Deposit and Treasury Bills, Financial Markets: Meaning Characteristics and Classification of Financial Markets	7	L1,L2

		Capital Market Money Market and Foreign Currency Market Financial Institutions: Meaning Characteristics and Classification of Financial Institutions, Commercial Banks , Investment Merchant Banks and Stock Exchanges		
2	**Concepts of Returns and Risks**		6	L1,L2,L3
		Measurement of Historical Returns and Expected Returns of a Single Security and a Two-security Portfolio Measurement of Historical Risk and Expected Risk of a Single Security and a Two-security Portfolio Time Value of Money Future Value of a Lump Sum Ordinary Annuity and Annuity Due Present Value of a Lump Sum, Ordinary Annuity and Annuity Due, Continuous Compounding and Continuous Discounting		
3	**Overview of Corporate Finance**		9	L1, L2, L3, L4
		Objectives of Corporate Finance, Functions of Corporate Finance Investment Decision, Financing Decision and Dividend Decision Financial Ratio Analysis: Overview of Financial Statements Balance Sheet, Profit and Loss Account and Cash Flow Statement Purpose of Financial Ratio Analysis , Liquidity Ratios Efficiency or Activity Ratios , Profitability Ratios , Capital Structure Ratios , Stock, Market Ratios , Limitations of Ratio Analysis		
4	**Capital Budgeting**		10	L1,L2,L3,L4
		Meaning and Importance of Capital Budgeting Inputs for Capital Budgeting Decisions , Investment Appraisal Criterion—Accounting Rate of Return , Payback Period Discounted, Payback Period , Net Present Value(NPV) Profitability Index, Internal Rate of Return (IRR) and Modified Internal Rate of Return, (MIRR) Working Capital Management: Concepts of Meaning Working Capital , Importance of Working Capital Management Factors, Affecting an Entity's Working Capital Needs Estimation of Working, Capital Requirements, Management of Inventories, Management of Receivables , Management of Cash and Marketable Securities		
5	**Sources of Finance**		7	L1,L2,L3,L4,L5
		Long Term Sources—Equity, Debt, and Hybrids Mezzanine Finance, Sources of Short Term Finance—Trade Credit, Bank Finance, Commercial Paper; Project Finance. Capital Structure: Factors Affecting an Entity's Capital Structure Overview of Capital Structure Theories and Approaches Net Income Approach , Net Operating Income Approach Traditional Approach, Modigliani-Miller Approach. Relation between Capital Structure and Corporate Value, Concept of Optimal Capital Structure.		
6	**Dividend Policy**		6	L1,L2,L3

Meaning and Importance of Dividend Policy Factors Affecting an Entity's Dividend Decision, Overview of Dividend Policy Theories and Approaches, Gordon's Approach, Walter's Approach , Modigliani-Miller Approach.			
Total Hours	**45**		

Books and References:

Sr. No	Title	Authors	Publisher	Edition	Year
1	Fundamentals of Financial Management	Eugene F. Brigham and Joel F. Houston	Cengage Publications, New Delhi	13th Edition	2015
2	Analysis for Financial Management	Robert C. Higgins	McGraw Hill Education, New Delhi.	10th Edition	2013
3	Indian Financial System	M. Y. Khan	McGraw Hill Education, New Delhi	9th Edition	2015
4	Financial Management	I. M. Pandey	S. Chand (G/L) & Company Limited, New Delhi	11th Edition	2015

Online References:

Sr. No.	Website Name	URL	Modules Covered
1	www.nptel.ac.in	https://nptel.ac.in/courses/110105121/	M1- M6
2	www.nptel.ac.in	https://nptel.ac.in/courses/110106043/	M1-M6

B.E. Semester – VII
Choice Based Credit Grading Scheme with Holistic Student Development (CBCGS- H 2019)
TCET Autonomy Scheme (w.e.f. A.Y. 2022-23)

B.E (Information Technology)							B.E(SEM :VII)		
Course Name :Project-I							**Course Code :** PROJ- IT 701		
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	**Practical**	**Contact Hours**	**Credits**	**IA**	**ESE**	**OR**	**TW**		
-	6	6	3	-	-	25	25		50
IA: In-Semester Assessment **ESE :** End Semester 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: Knowledge of Software development lifecycle, Software Engineering and Project Management									

Course Objectives: The course intends to deliver the fundamentals of problems and challenges that need IT based solutions. Students will be introduced to the vast array of literature available of the various research challenges in the field of IT. Also To create awareness among the students of the characteristics of several domain areas where IT can be effectively used and To improve the team building, communication and management skills of the students.

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	Discover potential research areas in the field of IT.	L1, L2, L3,L4
2	Conduct a survey of several available literature in the preferred field of study.	L1, L2, L3
3	Compare and contrast the several existing solutions for research challenge.	L1, L2, L3,L4,L5
4	Demonstrate an ability to work in teams and manage the conduct of the research study.	L1, L2, L3,L4
5	Formulate and propose a plan for creating a solution for the research plan identified.	L1, L2, L3,L4
6	To report and present the findings of the study conducted in the preferred domain.	L1, L2, L3,L4

Guidelines:

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

2. Each group will be associated with a project mentor/guide. The group should meet with the project mentor/guide periodically and record of the meetings and work discussed must be documented.

3. Department has to allocate 1 day in VII semester and 2 day in VIII semester every week.

4. Students will do literature survey in Sem VI or Sem VII.

5. Students will do design, implementation and coding in Sem VII.

6. Each group along with its guide/mentor shall identify a potential research area/problem domain, on which the study is to be conducted.

7. Each team will do a rigorous literature survey of the problem domain by reading and understanding at least 3-5 research papers from current good quality national/international journals/conferences. (Papers selected must be indexed by Scopus/IEEE/Springer/ACM etc.). The list of papers surveyed must be clearly documented.

8. The project assessment for term work will be done at least two times at department level by giving presentation to panel members which consist of at least three (3) members as Internal examiners (including the project guide/mentor) appointed by the Head of the department of respective Programme.

9. A report is to be prepared summarizing the findings of the literature survey. A comparative evaluation of the different techniques surveyed is also to be done.

10. Students will do testing and analyze in Sem VIII

11. Teams must analyze all the results obtained by comparing with other standard techniques.

12. Every team has to compulsorily publish their work in national / international conference/journals (if possible publish in Scopus indexed journals).

B.E. Semester – VII
Choice Based Credit Grading Scheme with Holistic Student Development (CBCGS- H 2019)
TCET Autonomy Scheme (w.e.f. A.Y. 2022-23)

B.E. Information Technology							B.E. SEM: VII	
Course Name: Summer Internship							**Course Code: SI-IT701**	
Contact Hrs. during Semester Break/ End of Semester (Between 21st and 25th Week)						**Assessment/Evaluation Scheme**		
						Presentation	**Report**	
Theory	**AC**	**Practical**	**Contact Hours**	**Credits**		**AC**	**AC**	**TW**
-	-	-	120 *	-		-	-	-
AC- Activity evaluation **TW –** Term Work Examination								

#As per AICTE, Students has to earn 100 Points by participating in 400 Hrs. of activities during 4 years of Engineering. After Completing 48 hrs. of Activities, Students can earn 12 Points. This Points will not be reflected in Grade Card. Separate transcript will be issued to students after completion of Final Year.
* Total hrs. mentioned should be completed till end of Semester 8. Credits will be awarded at the end of 8th Semester and will be reflected in the Grade Card of 8th Semester. Student will get 1 year span to acquire the credits. Student will submit a report at the end of 8th Semester to earn termwork marks in internship

Prerequisite: Fundamental knowledge of Information Technology related tools

Course Objectives:
To get industry like exposure in the college laboratories by carrying out projects using subject studied till 8Th 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

Detailed Syllabus:

Module No.	Topics	Cognitive levels of attainment as per Bloom's Taxonomy
1	**Program Specific Internship**	L1, L2, L3
	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	
2	**Inter disciplinary Internship**	L1, L2, L3
	• To explore and understand issues and challenges in the other disciplines (E&TC, ELEX, MECH and CIVIL) • Design , develop and deploy cost effective products using multidisciplinary approach	
3	**Industry Specific Internship**	L1, L2, L3
	• To explore and understand issues and challenges in industry • Developing solutions for industry specific problems • Design , develop and deploy products for startup and SMEs	
4	**Interpersonal Internship**	L1, L2, L3
	• To develop interpersonal skills such as leadership, marketing ,publicity and corporate ethics and communication • To get competence in problem solving , presentation , negotiation skills	
5	**Social Internship**	L1, L2, L3
	• Identify and study different real life issues in the society • Identify societal problems and provide engineering solutions to solve these problems	
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	First	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

B.E. Semester – VII
Choice Based Credit Grading Scheme with Holistic Student Development (CBCGS- H 2019)
TCET Autonomy Scheme (w.e.f. A.Y. 2022-23)

BE Information Technology							B.E. SEM: VII		
Course Name: Professional Skills VII (R Programming Language)							**Course Code: HSD- ITPS701**		
Teaching Scheme (Program Specific)						**Examination Scheme (Formative/ Summative)**			
Modes of Teaching / Learning / Weightage						**Modes of Continuous Assessment / Evaluation**			
Total Hours Per Week **Conducted in the beginning of Semester during first 3 Weeks**					**Theory (100)**		**Presentation (50)**	**Report (25)**	**Total**
Theory	**Tutorial**	**Practical**	**Contact Hours**	**Credits**	**I A**	**ESE**	**AC**	**AC**	**75**
15	-	30	45	2	_	_	50	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: Any fundamental programming language and Object Oriented Programming Concepts, basics of statistics and data mining concepts.

Course Objective: Course intends to provide the basics of R programming, in-demand skill-sets required in both the research and business environments. To introduce the extended R environment of libraries and packages to demonstrate usage of as standard Programming Language for getting familiarize students with how various statistics can be collected for data exploration in R. This Course encourage Students to develop small projects.

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	Install and use R for simple programming tasks.	L1, L2
2	Extend the functionality of R by using add-on packages	L1, L2
3	Extract data from files and other sources and perform various data manipulation tasks on them.	L2, L3
5	Use R Graphics and Tables to visualize results of various statistical operations on data.	L2, L3, L4
6	Apply the knowledge of R gained to data Analytics for real life applications.	L3, L4, L6

Detailed Syllabus:

Module No.	Topics	Hrs.	Cognitive levels of attainment as per Bloom's Taxonomy
1	**Introduction**	2	L1, L2, L3
	Introducing to R , R Data Structures , Help functions in R , Vectors ,Scalars , Declarations , recycling , Common Vector operations , Using all and any , Vectorized operations , NA and NULL values , Filtering , Vectorised if-then else , Vector Equality , Vector Element names		
2	**Control Structures**	2	L1,L2,L3
	Conditional Statements, control structures and functions, Grouping, Scoping Rule, Coding Standards, Dates and Times		
3	**R as a programming language**	2	L1, L2, L3
	Exploratory data analysis: Range, summary, mean, variance, median, standard deviation, histogram, box plot, scatterplot		
4	**Graphics in R**	3	L1,L2,L3,L4
	Graphics and tables, Working with larger datasets, Building tables with aggregate, Introduction to ggplot2 graphics,		
5	**Regression and correlation**	3	L1,L2,L3,L4
	Simple regression and correlation, Multiple regression, Tabular data and analysis of Categorical data		
6	**R for Data Science**	3	L1,L2,L3,L4,L5, L6
	Implementing a mini project using any data mining or big data analytics algorithm in R, Extracting data from a large Dataset, Exploratory analysis, Using Mining algorithm, Visualizations and interpretation of results.		
	Total Hours	15	

List of Experiments:

Sr. No.	Type of Experiment	Practical/Experiment topic	Hrs.	Cognitive levels of attainment as per Bloom's Taxonomy
1		Write a R program to take input from the user (name and age) and display the values	2	L1, L2
2	Basic experiment	Write a R program to find the maximum and the minimum value of a given vector.	2	L2, L3
3		Write a R program to get the unique elements of a given string and unique numbers of vector.	2	L2, L3
4	Design Experiment	Write a R program to list containing a vector, a matrix and a list and give names to the elements in the list.	2	L2, L3
5		Write a R program to create a data frame from four given vectors.	2	L2, L3

6		Write a R program to perform data analysis.	2	L2, L3
7		Perform data visualization in R Programming.	2	L2, L3, L4
8		Perform Regression in R programming using any dataset.	2	L2, L3,L4
9		Perform decision tree classification in R Programming.	2	L2, L3, L4
10		Perform co-relation analysis in R programming.	4	L2, L3, L4,L5
11	Group Activity/ Case study	Machine learning in R programming.	6	L2, L3, L4,L5
		Total Hrs.	30	

Books and References:

Sr. No.	Title	Authors	Publisher	Edition	Year
1	R Cookbook Paperback , 2011	Teetor Paul	O Reilly Publications	First	2011
2	Beginning R: The Statistical Programming Language	Dr. Mark Gardener	Wiley Publications	First	2018
3	R Programming For Dummies	Joris Meys Andrie de Vries	Wiley Publications	Second	2018

Reference Books:
1. Hands-On Programming with R by Grolemund, O Reilly Publications
2. R for Everyone: Advanced Analytics and Graphics, 1e by Lander, Pearson Ltd.
3. R for Data Science Learning Dan Toomey December 2014 Packt Publishing Limited

Online References:

Sr. No.	Website Name	URL	Modules covered
7.	**Error! Hyperlink reference not valid.**	https://cran.r-project.org/doc/manuals/r-release/R-intro.pdf (Online Resources)	M1-M6
8.	https://www.coursera.org	https://www.coursera.org/learn/r-programming	M2
9.	https://www.geeksforgeeks.org	https://www.geeksforgeeks.org/graph-plotting-in-r-programming/	M4
10.	https://psu-psychology.github.io	https://psu-psychology.github.io/r-bootcamp-2018/talks/correlation_regression.html	M5
11.	https://r4ds.had.co.nz	https://r4ds.had.co.nz/index.html	M6

B.E. Semester – VII
Choice Based Credit Grading Scheme with Holistic Student Development (CBCGS- H 2019)
TCET Autonomy Scheme (w.e.f. A.Y. 2022-23)

B.E. Information Technology						B.E. SEM: VII	
Course Name: Research Based Learning III						**Course Code:** HSD-ITRBL 701	
Teaching Scheme (Program Specific)						**Examination Scheme (Formative/ Summative)**	
Modes of Teaching / Learning / Weightage						**Assessment/Evaluation Scheme**	
Total Hours Conducted in the beginning of Semester during first 3 Weeks						**Presentation**	**Report**	**Term Work**
Theory	Tutorial	Practical	Contact Hours	Credits	**AC**	**AC**	**TW**
-	-	30	30	1	25	25	50
Audit course evaluated by Teacher Guardian							
Mid Semester Assessment for Term work will be on continuous basis							
Prerequisite: Subject knowledge, Domain knowledge							

Course Objectives: This course is focused to engage the learner in testing & validation, developing business models & exploring possibilities in areas of research and consultancy.

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

Sr No.	Course Outcome	Cognitive level attainment as per revised Bloom Taxonomy
1	Student will be aware of latest technologies developments, tools and project development aspects.	L1, L2
2	Student will be able assess themselves in competitive business environment.	L1, L2, L3,L4
3	Students will be able to test their skills in the areas of consultancy .	L1, L2, L3,L4,l5,L6
4	Students will be able to put across their work by publishing papers	L1, L2, L3,L4,l5

Detailed Syllabus:

Module No.	Topics	Cognitive level attainment as per revised Bloom Taxonomy
1	**Search of relevant industry/labs/start ups for project area** Identification of Industry for the cause, opportunity, documentation . Testing of mathematical modeled as per standards available. Submission of report/Presentation and evaluation	L1, L2, L3
2	**Business plan development of proto type Business canvas development Enhance prototype** I. Key Partners II. Key Activities III. Value Propositions IV. Customer Relationships Customer Segments V. Key Resources	L1, L2, L3,L4

		VI. Channels VII. Cost Structure VIII. Revenue Streams Presentation and evaluation	
3		**Participation in competition/Working as research grant group/consultancy group/etc.** I. Participation in project competitions a) Participating at institute /national level /university level /participate in competitions. b) Participation in funded project/consultancy projects II. Research grant: Identifying research grant proposal like University level, industry level,etc ,Proposal writing, making budget,etc III Evaluation : Evaluation based on level of participation ,proposal made,etc competition and evaluation	L1, L2, L3,L4
4		**Publish paper at institute /national level conference /participate in competition /participate in funded project/consultancy project** Identification of conference and track on the basis research proposal/theme (Institute/National/International) OR Participating at institute /national level /university level /participate in competitions OR Worked report /proto type validation by industry/consultancy project Evaluation of research review paper.	L1, L2, L3,L4,L5

References:

Sr. No.	Title	Authors	Publisher	Edition	Year
1.	Guide to Competitive Programming: Learning and Improving Algorithms Through Contests	Antti Laaksonen	Springer	Kindle	2018
2.	Business Model Generation: A Handbook for Visionaries, Game Changers, and Challengers	Alexander Osterwalder, Yves Pigneur	John Wiley & Sons.	1st	2013
3.	How to Write a Good Research Paper	Peter Haisler	Samfundslitteratur	Kindle	2009

Online References:

Sr. No.	Website Name	URL	Modules Covered
1.	https://canvanizer.com	https://canvanizer.com/new/business-model-canvas	M2
2.	https://www.researchgate.net	https://www.researchgate.net/publication/224372998_Idea_Generation_Techniques_among_Creative_Professionals	M3
3.	https://www.startupindia.gov.in	https://www.startupindia.gov.in/content/sih/en/reources.html	M3
4.	https://www.slideshare.net	https://www.slideshare.net/AsirJohnSamuel/1introduction-to-research-methodology?next_slideshow=1	M4