M.E. Semester –II
Choice Based Credit Grading Scheme (CBCGS 2019)
Proposed Syllabus under Autonomy Scheme

IT (Information Technology)							SEM : II		
Course Name : Advanced Algorithms							**Course Code :**2IT05		
Contact Hours Per Week : 03							**Credits** : 03		
Teaching Scheme (Program Specific)						**Examination Scheme (Formative/ Summative)**			
Modes of Teaching / Learning / Weightage						**Modes of Continuous Assessment / Evaluation**			
Hours Per Week						**Theory (100)**	**Practical/ Oral (25)**	**Term Work (25)**	**Total**
Theory	**Tutorial**	**Practical**	**Contact Hours**	**Credits**	**IA**	**ESE**	**PR**	**TW**	
3	-	-	3	3	25	75	-	-	**100**
IA: In-Semester Assessment - Paper Duration – **1.5 Hours** **ESE :** End Semester Examination - Paper Duration - **3 Hours** **The weightage of marks for continuous evaluation of Term work/Report: Formative (40%), Timely completion of Practical (40%) and Attendance (20%)**									
Prerequisite: UG level course in Algorithm Design and Analysis									

Course Objectives:
1. Introduce students to the advanced methods of designing and analyzing algorithms.
2. The student should be able to choose appropriate algorithms and use it for a specific problem.
3. To familiarize students with basic paradigms and data structures used to solve advanced algorithmic problems.
4. Students should be able to understand different classes of problems concerning their computation difficulties.
5. To introduce the students to recent developments in the area of algorithmic design.

Course Outcomes:

Sr. No.	Course Outcomes	Cognitive Levels Of Attainment As Per Bloom's Taxonomy
1	Analyze the complexity/performance of different algorithms.	Remember (R), Understand (U), Apply (A),Analyse (An)
2	Determine the appropriate data structure for solving a particular set of problems.	Remember (R), Understand (U), Apply (A),Analyse (An)
3	Categorize the different problems in various classes according to their complexity.	Remember (R), Understand (U), Apply (A),Analyse (An),Evaluate (E)
4	Students should have an insight of recent activities in the field of the advanced data structure.	Remember (R), Understand (U), Apply (A),Analyse (An),Evaluate (E),Create (C)

Detailed syllabus:

Sr. No.	Detailed Content	Hrs	Cognitive Levels Of Attainment As Per Bloom's Taxonomy
1	Analysis of Algorithms-review of algorithmic strategies, asymptotic analysis, solving recurrence relations through Substitution Method, Recursion Tree, and Master MethodSorting: Review of various sorting algorithms, topological sorting Graph: Definitions and Elementary Algorithms: Shortest path by BFS, shortest path in edge-weighted case (Dijkasra's), depth-first search and computation of strongly connected components, emphasis on correctness proof of the algorithm and time/space analysis, example of amortized analysis.	06	Remember (R), Understand (U), Apply (A),Analyse (An)
2	Matroids: Introduction to greedy paradigm, algorithm to compute a maximum weight maximal independent set. Application to MST. Graph Matching: Algorithm to compute maximum matching. Characterization of maximum matching by augmenting paths, Edmond's Blossom algorithm to compute augmenting path.	08	Remember (R), Understand (U), Apply (A),Analyse (An)
3	Flow-Networks: Maxflow-mincut theorem, Ford-Fulkerson Method to compute maximum flow, Edmond-Karp maximum-flow algorithm. Matrix Computations: Strassen's algorithm and introduction to divide and conquer paradigm, inverse of a triangular matrix, relation between the time complexities of basic matrix operations, LUP-decomposition.	09	Remember (R), Understand (U), Apply (A),Analyse (An),Evaluate (E)
4	Shortest Path in Graphs: Floyd-Warshall algorithm and introduction to dynamic programming paradigm. More examples of dynamic programming. Modulo Representation of integers/polynomials: Chinese Remainder Theorem, Conversion between base-representation and modulo-representation. Extension to polynomials. Application: Interpolation problem. Discrete Fourier Transform (DFT): In complex field, DFT in modulo ring. Fast Fourier Transform algorithm. Schonhage- Strassen Integer Multiplication algorithm	10	Remember (R), Understand (U), Apply (A),Analyse (An),Evaluate (E)
5	Linear Programming: Geometry of the feasibility region and Simplex algorithm NP-completeness: Examples, proof of NP-hardness and NP-completeness. One or more of the following topics based on time and interest Approximation algorithms, Randomized Algorithms, Interior Point Method, Advanced Number Theoretic Algorithm	10	Remember (R), Understand (U), Apply (A),Analyse (An),Evaluate (E)
6	Recent Trends in problem solving paradigms using recent searching and sorting techniques by applying recently proposed data structures.	05	Remember (R), Understand (U), Apply (A),Analyse (An),Evaluate (E),Create (C)

References:

1.   "Introduction to Algorithms" by Cormen, Leiserson, Rivest, Stein.
2.   "The Design and Analysis of Computer Algorithms" by Aho, Hopcroft, Ullman.
3.   "Algorithm Design" by Kleinberg and Tardos.

M.E. Semester –II
Choice Based Credit Grading Scheme (CBCGS 2019)
Proposed Syllabus under Autonomy Scheme

IT (Information Technology)							SEM : II		
Course Name : Advanced Web Technology							**Course Code :** 2IT06		
Contact Hours Per Week : 03							**Credits** : 03		
Teaching Scheme (Program Specific)						**Examination Scheme (Formative/ Summative)**			
Modes of Teaching / Learning / Weightage						**Modes of Continuous Assessment / Evaluation**			
Hours Per Week						**Theory (100)**	**Practical/ Oral (25)**	**Term Work (25)**	**Total**
Theory	**Tutorial**	**Practical**	**Contact Hours**	**Credits**	**IA**	**ESE**	**PR/OR**	**TW**	
3	-	-	3	3	25	75	-	-	**100**
IA: In-Semester Assessment - Paper Duration – **1.5 Hours** **ESE :** End Semester Examination - Paper Duration - **3 Hours** **The weightage of marks for continuous evaluation of Term work/Report: Formative (40%), Timely completion of Practical (40%) and Attendance (20%)**									
Prerequisite: Web programming, C language									

Course Objectives:

1. Get familiar with Web Technologies.
2. Gaining a good grasp over Web 2.0 technologies in order to develop responsive web applications
3. Exploring the advantages of emerging web technologies and what environment they are being used in Exploring Web 3.0 and Semantic Web standards

Course Outcomes:

Sr. No.	Course Outcomes	Cognitive levels of attainment as per Bloom's Taxonomy
1	To design a responsive web site using HTML5 and CSS.	Remember (R), Understand (U), Apply (A), Create (C)
2	To design RIA using proper choice of Framework	Remember (R), Understand (U), Apply (A), Create (C)
3	To recognize and evaluate website organizational structure and design elements	Remember (R), Understand (U), Apply (A), Evaluate (E), Create (C)
4	Explain emerging web 3.0 standards	Remember (R), Understand (U)

Detailed syllabus:

Module No.	Detailed Content	Hrs	Cognitive levels of attainment as per Bloom's Taxonomy
1	**HTML 5**: Fundamental Syntax and Semantics, Progressive Markup and Techniques, Forms, Native Audio and Video, Micro data and Custom data, Accessibility, Geo-location, Canvas.	06	Remember (R), Understand (U), Apply (A), Create (C)
2	**Introduction to CSS:** Evolution of CSS, Syntax of CSS, Exploring CSS Selectors, Inserting CSS in an HTML Document, Defining Inheritance in CSS, CSS3 and Responsive Web Design. CSS3: Selectors, Typography and color Modes Stunning Aesthetics with CSS3, CSS3 Transitions, Transformations and Animations, Conquer Forms HTMEVALUATE (E) and CSS3	08	Remember (R), Understand (U), Apply (A), Create (C)
3	**Web Services:** Web services, Evolution and differences with Distributed computing, XML, WSDL, SOAP, UDDI, Transactions, Business Process Execution Language for Web Services, WS-Security and the Web services security Specifications, WS-Reliable Messaging, WS-Policy, WS- Attachments. REST-ful web services, Resource Oriented Architecture, Comparison of REST, SOA, SOAP.	07	Remember (R), Understand (U), Apply (A), Create (C)
4	**Introduction to Ajax:** Ajax Design Basics, JavaScript, Blogs, Wikis, RSS feeds Working with JavaScript Object Notation (JSON): Create Data in JSON Format, JSON parser, Implement JSON on the Server Side, Implementing Security and Accessibility in AJAX Applications: Secure AJAX Applications, Accessible Rich Internet Applications, Developing RIA using AJAX techniques: CSS, HTML, DOM, XMLHTTPRequest, JavaScript, PHP, AJAX as REST Client Open Source Frameworks and CMS for RIA: Django, Drupal, Joomla introduction and comparison.	08	Remember (R), Understand (U), Apply (A), Create (C)
5	**Introduction to Web Analytics 2.0 1:** State of the Analytics Union, State of the Industry, Rethinking Web Analytics: Meet Web Analytics 2.0, Optimal Strategy for Choosing Your Web Analytics Soul Mate. The Awesome World of Clickstream Analysis: Metrics. The Key to Glory: Measuring Success. Failing Faster: Unleashing the Power of Testing and Experimentation.	08	Remember (R), Understand (U), Apply (A), Create (C)
6	**Web 3.0 and Semantic Web:** Challenges, Components, Semantic Web Stack: RDF, RDF Schema (RDFS), Simple Knowledge Organization System (SKOS), SPARQL as RDF query language, N-Triples as a format for storing and transmitting data, Turtle (Terse RDF Triple Language), Web Ontology Language (OWL) a family of knowledge representation languages, Rule Interchange Format (RIF), a framework of web rule language dialects supporting rule interchange on the Web.	08	Remember (R), Understand (U), Apply (A), Create (C)

References:

1. Grigoris Antoniou and Frank van Harmelen,. A Semantic Web Primer: MIT Press, 2004, ISBN 0-262- 01210-3
2. Deane Brker, Web Content Management: Systems, Features, and Best Practices, O'Reilly & Associates incorporated, 2016
3. John Domingue, Dieter Fensel, Handbook of Semantic Web Technologies, Springer Reference
4. Liyang Yu, a Developer's Guide to the Semantic Web, Second Edition, Springer
5. An introduction to RDF and Jena RDF API, www.jena.apache.org/tutorials/rdf_api.html.

M.E. Semester –II
Choice Based Credit Grading Scheme (CBCGS 2019)
Proposed Syllabus under Autonomy Scheme

ME (Information Technology)							SEM : II			
Course Name : Web Analytics and Development							**Course Code : 2IT311**			
Contact Hours Per Week : 03							**Credits** : 03			
Teaching Scheme (Program Specific)						**Examination Scheme (Formative/ Summative)**				
Modes of Teaching / Learning / Weightage						**Modes of Continuous Assessment / Evaluation**				
Hours Per Week					**Theory (100)**		**Practical/ Oral (25)**	**Term Work (25)**		**Total**
Theory	**Tutorial**	**Practical**	**Contact Hours**	**Credits**	**IA**	**ESE**	**PR/OR**	**TW**		
3	-	-	3	3	25	75	-	-		**100**
IA: In-Semester Assessment - Paper Duration – **1.5 Hours**										
ESE : End Semester Examination - Paper Duration - **3 Hours**										
The weightage of marks for continuous evaluation of Term work/Report: Formative (40%), Timely completion of Practical (40%) and Attendance (20%)										
Prerequisite: Databases, Probability										

Course objective: The course explores use of social network analysis to understand growing connectivity and complexity in the world ranging from small groups to WWW.

Course Outcomes:

Sr. No.	Course Outcomes	Cognitive levels of attainment as per Bloom's Taxonomy
1	Become familiar with core research communities, publications, focused on web and social media analytics and research questions engaged in	Remember (R), Understand (U), Analyse (An), Analyse (An), Create (C)

Detailed syllabus:

Module No.	Detailed Content	Hours	Cognitive levels of attainment as per Bloom's Taxonomy
1	Introduction – Social network and Web data and methods, Graph and Matrices, Basic measures for individuals and networks, Information Visualization	**06**	Remember (R), Understand (U), Apply (A)

2	Digital Analytics: Introduction to digital analytics, Building blocks, fundamental of Digital Analytics	08	Remember (R), Understand (U), Apply (A), Analyse (An)
3	Web Analytics tools: Click Stream Analysis, A/B testing, Online Surveys	08	Remember (R), Understand (U), Apply (A), Analyse (An)
4	Web Search and Retrieval: Search Engine Optimization, Web Crawling and indexing, Ranking Algorithms, Web traffic models	08	Remember (R), Understand (U), Apply (A), Analyse (An), Analyse (An)
5	Making Connection: Link Analysis, Random Graphs and Network evolution, Social Connects: Affiliation and identity	08	Remember (R), Understand (U), Apply (A), Analyse (An), Analyse (An), Create (C)
6	Connection: Connection Search, Collapse, Robustness Social involvements and diffusion of innovation	07	Remember (R), Understand (U), Apply (A), Analyse (An), Analyse (An), Create (C)

References:

1. Hansen, Derek, Ben Sheiderman, Marc Smith. 2011. Analyzing Social Media Networks with NodeXL: Insights from a Connected World. Morgan Kaufmann, 304.
2. Avinash Kaushik. 2009. Web Analytics 2.0: The Art of Online Accountability.
3. Easley, D. & Kleinberg, J. (2010). Networks, Crowds, and Markets: Reasoning About a Highly Connected World. New York: Cambridge University Press. http://www.cs.cornell.edu/home/kleinber/networks-book/
4. Wasserman, S. & Faust, K. (1994). Social network analysis: Methods and applications. New York: Cambridge University Press. Monge, P. R. & Contractor, N. S. (2003). Theories of communication networks. New York: Oxford University Press.

M.E. Semester –II
Choice Based Credit Grading Scheme (CBCGS 2019)
Proposed Syllabus under Autonomy Scheme

ME (Information Technology)						SEM : II			
Course Name : Data Security and Access Control						**Course Code : 2IT312**			
Contact Hours Per Week : 03						**Credits** : 03			
Teaching Scheme (Program Specific)						**Examination Scheme (Formative/ Summative)**			
Modes of Teaching / Learning / Weightage						**Modes of Continuous Assessment / Evaluation**			
Hours Per Week					**Theory (100)**		**Practical/Oral (25)**	**Term Work (25)**	**Total**
Theory	**Tutorial**	**Practical**	**Contact Hours**	**Credits**	**IA**	**ESE**	**PR/OR**	**TW**	
3	-	-	3	3	25	75	-	-	**100**

IA: In-Semester Assessment - Paper Duration – **1.5 Hours**
ESE : End Semester Examination - Paper Duration - **3 Hours**
The weightage of marks for continuous evaluation of Term work/Report: Formative (40%), Timely completion of Practical (40%) and Attendance (20%)

Prerequisite: Databases, Probability

Course objective: The objective of the course is to provide fundamentals of database security.
Various access control techniques mechanisms were introduced along with application areas of access controltechniques.

Course Outcomes:

Sr. No.	Course Outcomes	Cognitive levels of attainment as per Bloom's Taxonomy
1	In this course, the students will be enabled to understand and implement classical models andalgorithms	Remember, Understand, Apply , Analyze
2	They will learn how to analyse the data, identify the problems, and choose the relevant modelsand algorithms to apply.	Remember, Understand, Apply , Analyze, Evaluate
3	They will further be able to assess the strengths and weaknesses of various access control modelsand to analyse their behaviour.	Remember, Understand, Apply , Analyze, Evaluate

Detailed syllabus:

Module No.	Detailed Content	Hours	Cognitive levels of attainment as per Bloom's Taxonomy
1	Introduction to Access Control, Purpose and fundamentals of access control, brief history, Policies of Access Control, Models of Access Control, and Mechanisms, Discretionary Access Control (DAC), Non-Discretionary Access Control, Mandatory Access Control (MAC). Capabilities and Limitations of Access Control Mechanisms: Access Control List (ACL) and Limitations, Capability List and Limitations.	10	Remember, Understand, Apply

2	Role-Based Access Control (RBAC) and Limitations, Core RBAC, Hierarchical RBAC, Statically Constrained RBAC, Dynamically Constrained RBAC, Limitations of RBAC.Comparing RBAC to DAC and MAC Access control policy.	06	Remember, Understand, Apply , Analyze
3	Biba'sintregity model, Clark-Wilson model, Domain type enforcement model, mapping the enterprise view to the system view, Role hierarchies-inheritance schemes, hierarchy structures and inheritance forms, using SoD in real system Temporal Constraints in RBAC, MAC AND DAC. Integrating RBAC with enterprise IT infrastructures: RBAC for WFMSs, RBAC for UNIX and JAVA environments Case study: Multi line Insurance Company	08	Remember, Understand, Apply , Analyze, Evaluate
4	Smart Card based Information Security, Smart card operating system- fundamentals, design and implantation principles, memory organization, smartcard files, file management, atomic operation, smart card data transmission ATR, PPS Security techniques- user identification, smart card security, quality assurance and testing, smart card life cycle-5 phases, smart card terminals.	08	Remember, Understand, Apply , Analyze
5	Recent trends in Database security and access control mechanisms. Case study ofRole-Based Access Control (RBAC) systems.Access control of relational databases, Temporal role-based access control in database management, Access control methods for XML database managing and Querying Encrypted Data, Security in Data Warehouses and OLAP systems.	08	Remember, Understand, Apply , Analyze
6	Recent Trends related to data security management, vulnerabilities in differentDBMS.Secure semantic web services, Geospatial Database security, Damage Quarantine and Recovery in Data Processing systems, Privacy-enhanced Location-based Access control, Efficiency forcing the security and Privacy in Mobile environment.	08	Remember, Understand, Apply

References:

1. Role Based Access Control: David F. Ferraiolo, D. Richard Kuhn, RamaswamyChandramouli.
2. http://www.smartcard.co.uk/tutorials/sct-itsc.pdf: Smart Card Tutorial.
3. Handbook of Data Security: Applications and Trends by MichealGertz and Sushil Jajodia
4. Database Security and Auditing, Hasan A. Afyouni, India Edition, Cengage Learning, 2009
5. Database Security, Castano, Second edition, Pearson Education
6. Database security by Alfred basta, Melissa zgola, Cengage Learning
7. BhavaniThuraisingham, "Database & application security (Integrity information security & Data Management)", Auerbach Publication Taylor &Francin Group

M.E. Semester –II
Choice Based Credit Grading Scheme (CBCGS 2019)
Proposed Syllabus under Autonomy Scheme

ME (Information Technology)								SEM : II		
Course Name : Data Visualization								**Course Code : 2IT313, 2IT332**		
Contact Hours Per Week : 03								**Credits** : 03		
Teaching Scheme (Program Specific)							**Examination Scheme (Formative/ Summative)**			
Modes of Teaching / Learning / Weightage							**Modes of Continuous Assessment / Evaluation**			
Hours Per Week						**Theory (100)**		**Practical/Oral (25)**	**Term Work (25)**	**Total**
Theory	**Tutorial**	**Practical**	**Contact Hours**	**Credits**	**IA**	**ESE**		**PR/OR**	**TW**	
3	-	-	3	3	25	75		-	-	**100**
IA: In-Semester Assessment - Paper Duration – **1.5 Hours** **ESE :** End Semester Examination - Paper Duration - **3 Hours** **The weightage of marks for continuous evaluation of Term work/Report: Formative (40%), Timely completion of Practical (40%) and Attendance (20%)**										
Prerequisite: Databases, Probability										

Course objective:

1. familiarize students with the basic and advanced techniques of information visualization and scientific visualization,
2. to learn key techniques of the visualization process
3. a detailed view of visual perception, the visualized data and the actual visualization, interaction and distorting techniques

Course Outcomes:

Sr. No.	Course Outcomes	Cognitive levels of attainment as per Bloom's Taxonomy
1	Design and create data visualizations, Conduct exploratory data analysis using visualization, Craft visual presentations of data for effective communication.	Understand (U), Apply (A), Analyse (An), Evaluate (E)
2	Preparation and processing of data, visual mapping and the visualization, Design and evaluate color palettes for visualization based on principles of perception.	Analyse (An), Evaluate (E), Create (C)
3	Apply data transformations such as aggregation and filtering for visualization,Identify opportunities for application of data visualization in various domains	Apply (A), Evaluate (E), Create (C)

Detailed syllabus:

Module No.	Detailed Content	Hours	Cognitive Levels Of Attainment As Per Bloom's Taxonomy
1	Data Representation: Continuous Data, SampledData, DiscreteDatasets, CellTypes, Grid Types,Contents,Attributes,Computing Derivatives of Sampled Data Implementation,Advanced Data Representation	08	Remember (R), Understand (U), Apply (A)
2	Handling Large Data Volumes, Visualizing Semi structured and Unstructured Data, Filtering Big Data, Introduction of visual perception, Gestalt principles, and information overloads.Creating visual representations, visualization reference model, visual mapping, visual analytics, Design of visualization applications.	08	Apply (A), Analyse (An)
3	Classification of visualization systems, Interaction and visualization techniquesmisleading, Visualization of one, two and multi-dimensional data, text and text documents, Hands on with Tableau	10	Understand (U)
4	Visualization of groups, trees, graphs, clusters, networks, software, Metaphorical visualization	11	Understand (U), Apply (A)
5	Visualization of volumetric data, vector fields, processes and simulations,Visualization of maps, geographic information, GIS systems, collaborative visualizations, Evaluating visualizations	7	Understand (U), Apply (A), Evaluate (E)
6	Recent trends in various perception techniques, various visualization techniques,data structures used in data visualization.	4	Understand (U), Apply (A)

References:

1. WARD, GRINSTEIN, KEIM,.Interactive Data Visualization: Foundations, Techniques, and Applications. Natick : A K Peters, Ltd.
2. E. Tufte, The Visual Display of Quantitative Information, Graphics Press.
3. Data Visualization Principles And Practice Second Edition,Alexandru Telea, Crc Press

M.E. Semester –II
Choice Based Credit Grading Scheme (CBCGS 2019)
Proposed Syllabus under Autonomy Scheme

ME (Information Technology)							SEM : II			
Course Name : Data Science							**Course Code : 2IT411, 2IT431**			
Contact Hours Per Week : 03							**Credits** : 03			
Teaching Scheme (Program Specific)						**Examination Scheme (Formative/ Summative)**				
Modes of Teaching / Learning / Weightage						**Modes of Continuous Assessment / Evaluation**				
Hours Per Week						**Theory (100)**		**Practical/Oral (25)**	**Term Work (25)**	**Total**
Theory	**Tutorial**	**Practical**	**Contact Hours**	**Credits**		**IA**	**ESE**	**PR/OR**	**TW**	
3	-	-	3	3		25	75	-	-	**100**

IA: In-Semester Assessment - Paper Duration – **1.5 Hours**
ESE : End Semester Examination - Paper Duration - **3 Hours**
The weightage of marks for continuous evaluation of Term work/Report: Formative (40%), Timely completion of Practical (40%) and Attendance (20%)

Prerequisite: Relational database, KDD process, Introduction to BIG data, What is Hadoop, Core components of Hadoop, Hadoop ecosystem

Course objective:

1. Provide Insights about the Roles of a Data Scientist and enable to analyze the Big Data.
2. Understand the principles of Data Science for the data analysis and learn cutting edge tools and techniques for data analysis.
3. Figure Out Machine Learning Algorithms.
4. Learn business decision making and Data Visualization

Course Outcomes:

Sr. No.	Course Outcomes	Cognitive levels of attainment as per Bloom's Taxonomy
1	Demonstrate knowledge of statistical and exploratory data analysis data analysis techniques utilized in decision making.	Remember, Understand, Apply , Analyze
2	Apply principles of Data Science to the analysis of business problems.	Remember, Understand, Apply , Analyze, Evaluate
3	To use Machine Learning Algorithms to solve real-world problems.	Remember, Understand, Apply , Analyze, Evaluate
4	To provide data science solution to business problems and visualization.	Remember, Understand, Apply , Analyze, Evaluate

Detailed syllabus:

Sr. No.	Detailed Content	Hours	Cognitive levels of attainment as per Bloom's Taxonomy
1	**An Introduction to Data Science** Definition, working, benefits and uses of Data Science, Data science vs BI, The data science process, Role of a Data Scientist,	04	Remember, Understand, Apply
2	**Statistical Data Analysis & Inference** Populations and samples, Statistical modeling, probability distributions, fittings a model, Statistical methods for evaluation, Exploratory Data Analysis	08	Remember, Understand, Apply , Analyze
3	**Learning Algorithms** k-nearest neighbor, Simple and multiple Linear Regression, Logistic Regression, Support vector machine, Model-Based Clustering, Clustering High-Dimensional Data,	12	Remember, Understand, Apply , Analyze
4	**Data Visualization** Data Visualization basics, techniques, types, applications, tools, Data Journalism, Interactive dashboards,	08	Remember, Understand, Apply , Analyze
5	**Advance Analytical Methods** Text Analysis- Text analysis steps, A text analysis example, Collecting raw text and representing text, TF and TFIDF, Categorizing documents by topics, determining sentiments, Time series analytics- overview, ARIMA model,	08	Remember, Understand, Apply , Analyze
6	**Business problems and data science solutions** Data Science and Business Strategy: Thinking Data- Analytically, Redux, Competitive Advantage with Data Science, Data Science Case Studies, Recommender systems,Case Study: Global Innovation Network and Analysis.	05	Remember, Understand, Apply , Analyze, Evaluate

References:

1. James, G., Witten, D., Hastie, T., Tibshirani, R. An introduction to statistical learning with applications in R. Springer, 2013.
2. Data Mining Concepts and Techniques, Third Edition, Jiawei Han, MichelineKamber, Jian Pei, Morgan Kaufmann
3. "Data Science for business", F. Provost, T Fawcett, 2013
4. Cathy O'Neil and Rachel Schutt. Doing Data Science, Straight Talk From The Frontline. O'Reilly. 2014.

M.E. Semester –II
Choice Based Credit Grading Scheme (CBCGS 2019)
Proposed Syllabus under Autonomy Scheme

ME (Information Technology)					SEM : II			
Course Name : Knowledge Discovery					**Course Code :** 2IT412			
Contact Hours Per Week : 03					**Credits** : 03			
Teaching Scheme (Program Specific)					**Examination Scheme (Formative/ Summative)**			
Modes of Teaching / Learning / Weightage					**Modes of Continuous Assessment / Evaluation**			
Hours Per Week					**Theory (100)**		**Practical/Oral (25)**	**Term Work (25)**	**Total**
Theory	**Tutorial**	**Practical**	**Contact Hours**	**Credits**	**IA**	**ESE**	**PR**	**TW**	
3	-	-	3	3	25	-	-	-	**100**

IA: In-Semester Assessment - Paper Duration – **1.5 Hours**
ESE : End Semester Examination - Paper Duration - **3 Hours**
The weightage of marks for continuous evaluation of Term work/Report: Formative (40%), Timely completion of Practical (40%) and Attendance (20%)

Prerequisite: Data structures, Basic Statistics

Course objective:

1. Conduct case studies on real data mining examples

Course Outcomes:

Sr. No.	Course Outcomes	Cognitive Levels Of Attainment As Per Bloom's Taxonomy
1	Able to have knowledge of various knowledge representation methods.	Understand (U), Apply (A), Analyse (An), Evaluate (E)

Detailed syllabus:

Module No.	Detailed Content	Hrs	Cognitive Levels Of Attainment As Per Bloom's Taxonomy
1	Introduction KDD and Data Mining - Data Mining and Machine Learning, Machine Learning and Statistics, Generalization as Search,Data Mining and Ethics	07	Remember (R), Understand (U)
2	Knowledge Representation - Decision Tables, Decision Trees, Classification Rules, Association Rules, Rules involving Relations, Trees for Numeric Predictions, Neural Networks, Clusters	10	Remember (R), Understand (U), Apply (A), Evaluate (E)

3	Decision Trees - Divide and Conquer, Calculating Information, Entropy, Pruning, Estimating Error Rates, The C4.5 Algorithm Evaluation of Learned Results- Training and Testing, Predicting Performance, Cross-Validation	09	Understand (U), Evaluate (E), Create (C)
4	Classification Rules - Inferring Rudimentary Rules, Covering Algorithms for Rule Construction, Probability Measure for Rule Evaluation, Association Rules, Item Sets, Rule Efficiency	08	Remember (R), Understand (U), Apply (A)
5	Numeric Predictions - Linear Models for Classification and Numeric Predictions, Numeric Predictions with Regression Trees, Evaluating Numeric Predictions	07	Apply (A), Analyse (An), Evaluate (E)
6	Artificial Neural Networks – Perceptron, Multilayer Networks, The Back propagation Algorithm Clustering - Iterative Distance-based Clustering, Incremental Clustering, The EM Algorithm	07	Apply (A), Analyse (An), Evaluate (E)

References:

1. Data mining and knowledge discovery handbook by Maimon, oded (et al.)
2. Data Cleansing : A Prelude to knowledge Discovery

M.E. Semester –II
Choice Based Credit Grading Scheme (CBCGS 2019)
Proposed Syllabus under Autonomy Scheme

ME (Information Technology)							SEM : II		
Course Name : Advanced Machine Learning							**Course Code : 2IT413, 2IT433**		
Contact Hours Per Week : 03							**Credits** : 03		
Teaching Scheme (Program Specific)						**Examination Scheme (Formative/ Summative)**			
Modes of Teaching / Learning / Weightage						**Modes of Continuous Assessment / Evaluation**			
Hours Per Week					**Theory (100)**		**Practical/Oral (25)**	**Term Work (25)**	**Total**
Theory	**Tutorial**	**Practical**	**Contact Hours**	**Credits**	**IA**	**ESE**	**PR**	**TW**	
3	-	-	3	3	25	75	-	-	**100**

IA: In-Semester Assessment - Paper Duration – **1.5 Hours** **ESE :** End Semester Examination - Paper Duration - **3 Hours** **The weightage of marks for continuous evaluation of Term work/Report: Formative (40%), Timely completion of Practical (40%) and Attendance (20%)**

Prerequisite: Machine Learning, Probability Theory

Course objective:

1. To introduce key concepts in pattern recognition and machine learning; including specific algorithms for classification, regression, clustering and probabilistic modeling.
2. To give a broad view of the general issues arising in the application of algorithms to analysing data, common terms used, and common errors made if applied incorrectly.
3. To demonstrate a toolbox of techniques that can be immediately applied to real world problems, or used as a basis for future research into the topic.

Course Outcomes:

Sr. No.	Course Outcomes	Cognitive levels of attainment as per Bloom's Taxonomy
1	Key concepts, tools and approaches for pattern recognition on complex data sets	Understand (U), Remember (R)
2	Kernel methods for handling high dimensional and non-linear patterns	Analyse (AN), Apply (A)
3	State-of-the-art algorithms such as Support Vector Machines and Bayesian networks and Deep learning methods	Understand (U), Analyse (AN), Apply (A), Evaluate (E), Create (C)
4	Learn how to build deep learning applications with TensorFlow. Solve real-world machine learning tasks: from data to inference	Understand (U), Analyse (AN), Apply (A), Create (C)
5	Theoretical concepts and the motivations behind different learning frameworks	Remember (R), Understand (U) , Analyse (AN)

Detailed syllabus:

Module No.	Detailed Content	Hours	Cognitive levels of attainment as per Bloom's Taxonomy
1	Key concepts, Supervised/Unsupervised Learning, Loss functions and generalization, Probability Theory, Parametric vs Non-parametric methods, Elements of Computational Learning TheoryEnsemble Learning, Bagging, Boosting, Random Forest	08	Understand (U), Remember (R)
2	Features and Importance, Feature scaling, The Curse of Dimensionality,Kernel Methods for non-linear data, Support Vector Machines, Kernel Ridge Regression, Structure Kernels, Kernel PCA, Latent Semantic Analysis	08	Analyse (AN), Apply (A), Create (C)
3	Bayesian methods for using prior knowledge and data, Bayesian inference, Bayesian Belief Networks and Graphical models, Probabilistic Latent Semantic Analysis, The Expectation-Maximization (EM) algorithm, Gaussian Processes	08	Understand (U), Analyse (AN), Evaluate (E), Create (C)
4	Regression Techniques,Numerical Optimization, Introduction to Neural Networks,Neural Architectures and Training,Deep learning methods Convolutions and the GoogLe Net,Dimensions revisited: The Auto-encoderRecurrent and Combined Architectures,	10	Understand (U), Analyse (AN), Apply (A), Create (C)
5	Machine Learning on devices with TensorFlow Lite,Machine Learning in the Cloud with TensorFlow-Serving,Machine Learning in-the-browser with TensorFlow.js,Machine Learning-based products and services from Google	09	Understand (U), Analyse (AN), Apply (A), Create (C)
6	Filter Methods - Sub-space approaches - Embedded methodsLow-Rank approaches - Recommender Systems. Application areas - Security - Business – Scientific, Recent trends in supervised and unsupervised learning algorithm,dimensional reducibility, feature selection and extraction	05	Remember (R), Understand (U), Analyse (AN)

References:

1. Christopher M. Bishop, Pattern Recognition and Machine Learning.
2. John Shawe-Taylor and NelloCristianini, Kernel Methods for Pattern Analysis.

Web Reference :https://www.udacity.com/course/intro-to-tensorflow-for-deep-learning--ud187

M.E. Semester –II
Choice Based Credit Grading Scheme (CBCGS 2019)
Proposed Syllabus under Autonomy Scheme

ME (Information Technology)							SEM : II		
Course Name : Security Assessment and Risk Analysis							**Course Code : 2IT321**		
Contact Hours Per Week : 03							**Credits** : 03		
Teaching Scheme (Program Specific)						**Examination Scheme (Formative/ Summative)**			
Modes of Teaching / Learning / Weightage						**Modes of Continuous Assessment / Evaluation**			
Hours Per Week					**Theory (100)**		**Practical/Oral (25)**	**Term Work (25)**	**Total**
Theory	**Tutorial**	**Practical**	**Contact Hours**	**Credits**	**IA**	**ESE**	**PR**	**TW**	
3	-	-	3	3	25	75	-	-	**100**
IA: In-Semester Assessment - Paper Duration – **1.5 Hours** **ESE :** End Semester Examination - Paper Duration - **3 Hours** **The weightage of marks for continuous evaluation of Term work/Report: Formative (40%), Timely completion of Practical (40%) and Attendance (20%)**									
Prerequisite: Databases, Probability									

Course objective:

1. Describe the concepts of risk management
2. Define and differentiate various Contingency Planning components
3. Integrate the IRP, DRP, and BCP plans into a coherent strategy to support sustained organizational operations.
4. Define and be able to discuss incident response options, and design an Incident Response Plan for sustained organizational operations.

Course Outcomes:

Sr. No.	Course Outcomes	Cognitive levels of attainment as per Bloom's Taxonomy
1	Capable of recommending contingency strategies including data backup and recovery and alternate site selection for business resumption planning	Remember (R),Understand (U),Apply (A),Analyse (An)
2	Skilled to be able to describe the escalation process from incident to disaster in case of security disaster.	Remember (R),Understand (U),Apply (A),Analyse (An)
3	Capable of Designing a Disaster Recovery Plan for sustained organizational operations.	Remember (R),Understand (U),Apply (A)
4	Capable of Designing a Business Continuity Plan for sustained organizational operations.	Remember (R),Understand (U),Apply (A)

Detailed syllabus:

Module No.	Detailed Content	Hours	Cognitive levels of attainment as per Bloom's Taxonomy
1	SECURITY BASICS: Information Security (INFOSEC) Overview: critical information characteristics – availability information states – processing security countermeasures education, training and awareness, critical information characteristics – confidentiality critical information characteristics – integrity, information states – storage, information states – transmission, security countermeasures policy, procedures and practices, threats, vulnerabilities.	08	Remember (R),Understand (U),Apply (A)
2	Threats to and Vulnerabilities of Systems: definition of terms (e.g., threats, vulnerabilities, risk), major categories of threats (e.g., fraud, Hostile Intelligence Service (HOIS), malicious logic, Performing the Assessment: Vulnerability scan and Exploitation: Internet Host and network enumeration, IP network Scanning, hackers, environmental and technological hazards, disgruntled employees, careless employees, HUMINT, and monitoring), threat impact areas, Countermeasures: assessments (e.g., surveys, inspections), Concepts of Risk Management: consequences (e.g., corrective action, risk assessment), cost/benefit analysis of controls, implementation of cost effective controls, monitoring the efficiency and effectiveness of controls (e.g., unauthorized or inadvertent disclosure of information), threat and vulnerability assessment	11	Remember (R),Understand (U),Apply (A),Analyse (An)
3	Security Planning: directives and procedures for policy mechanism, Risk Management: acceptance of risk (accreditation), corrective actions information identification, risk analysis and/or vulnerability assessment components, risk analysis results evaluation, roles and responsibilities of all the players in the risk analysis process, Contingency Planning/Disaster Recovery: agency response procedures and continuity of operations, contingency plan components, determination of backup requirements, development of plans for recovery actions after a disruptive event, development of procedures for offsite processing, emergency destruction procedures, guidelines for determining critical and essential workload, team member responsibilities in responding to an emergency situation	09	Remember (R),Understand (U),Apply (A),Analyse (An)
4	POLICIES AND PROCEDURES Physical Security Measures: alarms, building construction, cabling, communications centre, environmental controls (humidity and air conditioning), filtered power, physical access control systems (key cards, locks and alarms) Personnel Security Practices and Procedures: access authorization/verification (need to know), contractors, employee clearances, position sensitivity, security training and awareness, systems maintenance personnel, Administrative Security Procedural Controls: attribution, copyright protection and licensing , Auditing and Monitoring: conducting security reviews, effectiveness of security programs, investigation of security breaches, privacy review of accountability controls, review of audit trails and logs	08	Remember (R),Understand (U),Apply (A),Analyse (An)

5	Operations Security (OPSEC): OPSEC surveys/OPSEC planning INFOSEC: computer security – audit, cryptography encryption (e.g., point to point, network, link), cryptography key management (to include electronic key), cryptography strength (e.g., complexity, secrecy, characteristics of the key)	09	Remember (R),Understand (U),Apply (A)
6	Case study of threat and vulnerability assessment, Open source tools used for Assessment and Evaluation, and exploitation framework	03	Remember (R),Understand (U),Apply (A),Analyse (An)

References:

1. Principles of Incident Response and Disaster Recovery, Whitman &Mattord, Course Technology ISBN: 141883663X
2. (Web Link) http://www.cnss.gov/Assets/pdf/nstissi_4011.pdf

M.E. Semester –II
Choice Based Credit Grading Scheme (CBCGS 2019)
Proposed Syllabus under Autonomy Scheme

ME (Information Technology)							SEM : II		
Course Name : Secure Coding							Course Code : 2IT343		
Contact Hours Per Week : 03							Credits : 03		
Teaching Scheme (Program Specific)						Examination Scheme (Formative/ Summative)			
Modes of Teaching / Learning / Weightage						Modes of Continuous Assessment / Evaluation			
Hours Per Week						Theory (100)		Practical/Oral (25)	Term Work (25)	Total
Theory	Tutorial	Practical	Contact Hours	Credits	IA	ESE	PR	TW	
3	-	-	3	3	25	75	-	-	**100**

IA: In-Semester Assessment - Paper Duration – **1.5 Hours**
ESE : End Semester Examination - Paper Duration - **3 Hours**
The weightage of marks for continuous evaluation of Term work/Report: Formative (40%), Timely completion of Practical (40%) and Attendance (20%)

Prerequisite: Databases, Probability

Course objective:

1. Understand the basics of secure programming.
2. Understand the most frequent programming errors leading to software vulnerabilities.
3. Identify and analyze security problems in software.
4. Understand and protect against security threats and software vulnerabilities.
5. Effectively apply their knowledge to the construction of secure software systems

Course Outcomes:

Sr. No.	Course Outcomes	Cognitive levels of attainment as per Bloom's Taxonomy
1	Write secure programs and various risk in the software.	Understand (U),Understand (U),Apply (A),Create (C)
2	Eliminate security problems in the open source software.	Understand (U),Understand (U),Apply (A),Analyse (An),Evaluate (E)
3	Real time software and vulnerabilities associated with them.	Understand (U),Understand (U),Apply (A),Analyse (An),Evaluate (E)
4	Interrelate security and software engineering.	Understand (U),Understand (U),Apply (A),Analyse (An),Evaluate (E)

Detailed syllabus:

Module No.	Detailed Content	Hours	Cognitive levels of attainment as per Bloom's Taxonomy
1	Introduction to software security, Managing software security risk, Selecting software development technologies, An open source and closed source, Guiding principles for software security, Auditing software, Buffet overflows, Access control, Race conditions, Input validation, Password authentication	10	UNDERSTAND (U),UNDERSTAND (U),APPLY (A),CREATE (C)
2	Anti-tampering, Protecting against denial of service attack, Copy protection schemes, Client-side security, Database security, Applied cryptography, Randomness and determinism	07	Understand (U),Understand (U),Apply (A),Analyse (An),Evaluate (E)
3	Buffer Overrun, Format String Problems, Integer Overflow, and Software Security Fundamentals SQL Injection, Command Injection, Failure to Handle Errors, and Security Touchpoints	09	Understand (U),Understand (U),Apply (A),Analyse (An),Evaluate (E)
4	Cross Site Scripting, Magic URLs, Weak Passwords, Failing to Protect Data, Weak random numbers, improper use of cryptography	08	Understand (U),Understand (U),Apply (A),Analyse (An),Evaluate (E)
5	Information Leakage, Race Conditions, Poor usability, Failing to protect network traffic, improper use of PKI, trusting network name resolution	08	Understand (U),Understand (U),Apply (A),Analyse (An),Evaluate (E)
6	Case study of Cross Site Scripting, Magic URLs, Weak Passwords Buffet overflows, Access control, Race conditions.	05	Understand (U),Understand (U),Apply (A),Analyse (An),Evaluate (E)

References:

1. J. Viega, M. Messier. Secure Programming Cookbook, O'Reilly.
2. M. Howard, D. LeBlanc. Writing Secure Code, Microsoft
3. J. Viega, G. McGraw. Building Secure Software, Addison Wesley

M.E. Semester –II
Choice Based Credit Grading Scheme (CBCGS 2019)
Proposed Syllabus under Autonomy Scheme

ME (InformationTechnology)						SEM : II			
Course Name : Biometrics						**Course Code : 2IT323**			
Contact Hours Per Week : 03						**Credits** : 03			
Teaching Scheme (Program Specific)						**Examination Scheme (Formative/ Summative)**			
Modes of Teaching / Learning / Weightage						**Modes of Continuous Assessment / Evaluation**			
Hours Per Week						**Theory (100)**		**Practical/Oral (25)**	**Term Work (25)**	**Total**
Theory	**Tutorial**	**Practical**	**Contact Hours**	**Credits**	**IA**	**ESE**	**PR**	**TW**	
3	-	-	3	3	25	75	-	-	**100**

IA: In-Semester Assessment - Paper Duration – **1.5 Hours**
ESE : End Semester Examination - Paper Duration - **3 Hours**
The weightage of marks for continuous evaluation of Term work/Report: Formative (40%), Timely completion of Practical (40%) and Attendance (20%)

Prerequisite: Databases, Probability

Course objective:

The objective of this course is to introduce Bio-metric and traditional authentication methods. Application of bio-metric systems in government sector and various facerecognition and finger print recognition methods are included.

Course Outcomes:

Sr. No.	Course Outcomes	Cognitive levels of attainment as per Bloom's Taxonomy
1	A good understanding of the various methods for bio-metric and use of image processing for biometric.	Remember (R),Understand (U)
2	Analyzing various biometric technology and recognize the challenges and limitations associated with bio-metrics	Apply (A),Analyse (An),Evaluate (E)
3	Familiarity with different bio-metric traits with multi model and 3D biometric system and to appreciate their relative significance.	Understand (U),Apply (A),Evaluate (E)
4	Justifying the use of biometric system and its use for society	Remember (R),Understand (U),Analyse (An)
5	Evaluate and design security systems incorporating bio-metrics with appropriate case study.	Remember (R),Understand (U),Apply (A),Evaluate (E)
6	Identifying application areas of biometric and its design.	Remember (R),Understand (U),Apply (A),Evaluate (E)

Detailed syllabus:

Module No.	Detailed Content	Hours	Cognitive levels of attainment as per Bloom's Taxonomy
1	Introduction and Definitions of bio-metrics, Traditional authenticated methods and technologies, Overview of Image Processing / Edge Detection in Digital Images	07	Remember (R),Understand (U)
2	Bio-metric technologies: Fingerprint, Face, Iris, Hand Geometry, Gait Recognition, Ear, Voice, Palm print, On-Line Signature Verification, 3D FaceRecognition, Dental Identification and DNA. Performance Evaluation / Biometric System Design Challenges	09	Apply (A),Analyse (An),Evaluate (E)
3	The Law and the use of multimodal bio-metrics systems. Classification of 3D biometric imaging methods -3D biometric Technologies- 3D palm print capturing systems-3D information in palm print- Feature Extraction from 3D palm print –matching and fusion – security applications.	08	Understand (U),Apply (A),Evaluate (E)
4	BIOMETRIC IN SOCIETY AND ETHICAL USAGE Biometric Technologies issues- Biometrics in society –privacy and Biometrics –Ethics and Technology usage – human factors. Purpose – public sector Implementation – Border Control – Responsibilities –Customer service – Government sector – Agriculture – Academic Research – Online Communications – Environmental situations – External pressure – Distractions – Implementations issues – Future Works.	10	Remember (R),Understand (U),Analyse (An)
5	Case Studies of bio-metric system, Bio-metric Transaction. Bio-metric System Vulnerabilities.	05	Remember (R),Understand (U),Apply (A),Evaluate (E)
6	Application areas: surveillance applications- personal applications –design and deployment -user system interaction-operational processes – architecture –application development –design validation disaster recovery plan-maintenance-privacy concerns, Mobile Biometrics- Biometric Application Design	08	Remember (R),Understand (U),Apply (A),Evaluate (E)

References:

1. James wayman,Anil k.Jain ,Arun A.Ross ,Karthik Nandakumar, ―Introduction to Biometrics‖, Springer, 2011
2. John Vacca "Biometrics Technologies and Verification Systems" Elsevier 2007
3. James Wayman,Anil Jain,David MAltoni,DasioMaio(Eds) "Biometrics Systems Technology",Design and Performance Evalution.Springer 2005
4. Khalid saeed with Marcin Adamski, Tapalina Bhattasali, Mohammed K. Nammous, Piotr panasiuk, mariusz Rybnik and soharab H.Sgaikh, ―New Directions in Behavioral Biometrics‖, CRC Press 2017
5. Paul Reid "Biometrics For Network Security "Person Education 2004
6. David Zhang,Guangming, 3D Biometrics Systems and Applications‖ Lu, Springer 2013.
7. Ravindra Das, ―Adopting Biometric Technology: Challenges and Solutions‖, CRC Press, 2016.
8. Julian Ashbourn, ―Biometrics in the new world‖, Springer 2014
9. J. Viega, M. Messier. Secure Programming Cookbook, O'Reilly.
10. M. Howard, D. LeBlanc. Writing Secure Code, Microsoft

M.E. Semester –II
Choice Based Credit Grading Scheme (CBCGS 2019)
Proposed Syllabus under Autonomy Scheme

ME (Information Technology)							SEM : II		
Course Name : Digital Forensics							Course Code : 2IT421		
Contact Hours Per Week : 03							Credits : 03		
Teaching Scheme (Program Specific)						Examination Scheme (Formative/ Summative)			
Modes of Teaching / Learning / Weightage						Modes of Continuous Assessment / Evaluation			
Hours Per Week					Theory (100)		Practical/Oral (25)	Term Work (25)	Total
Theory	Tutorial	Practical	Contact Hours	Credits	IA	ESE	PR	TW	
3	-	-	3	3	25	75	-	-	100

IA: In-Semester Assessment - Paper Duration – **1.5 Hours**
ESE : End Semester Examination - Paper Duration - **3 Hours**
The weightage of marks for continuous evaluation of Term work/Report: Formative (40%), Timely completion of Practical (40%) and Attendance (20%)

Prerequisite: Cybercrime and Information Warfare, Computer Networks

Course objective:

1. Provides an in-depth study of the rapidly changing and fascinating field of computer forensics.
2. Combines both the technical expertise and the knowledge required to investigate, detect and prevent digital crimes.
3. Knowledge on digital forensics legislations, digital crime, forensics processes and procedures, data acquisition and validation, e-discovery tools
4. E-evidence collection and preservation, investigating operating systems and file systems, network forensics, art of steganography and mobile device forensics

Course Outcomes:

Sr. No.	Course Outcomes	Cognitive levels of attainment as per Bloom's Taxonomy
1	Understand relevant legislation and codes of ethics	Understand (U),
2	Computer forensics and digital detective and various processes, policies and procedures	Remember (R), Understand (U)
3	E-discovery, guidelines and standards, E-evidence, tools and environment.	Understand (U), Apply (A)
4	Email and web forensics and network forensics	Apply (A)

Detailed syllabus:

Module No.	Detailed Content	Hours	Cognitive levels of attainment as per Bloom's Taxonomy
1	Digital Forensics Science: Forensics science, computer forensics, and digital forensics. Computer Crime: Criminalistics as it relates to the investigative process, analysis of cyber-criminalistics area, holistic approach to cyber-forensics	09	Remember (R), Understand (U)
2	Cyber Crime Scene Analysis: Discuss the various court orders etc., methods to search and seizure electronic evidence, retrieved and un-retrieved communications, Discuss the importance of understanding what court documents would be required for a criminal investigation.	08	Understand (U), Apply (A)
3	Evidence Management & Presentation: Create and manage shared folders using operating system, importance of the forensic mindset, define the workload of law enforcement, Explain what the normal case would look like, Define who should be notified of a crime, parts of gathering evidence, Define and apply probable cause.	09	Apply (A), Analyse (An)
4	Computer Forensics: Prepare a case, Begin an investigation, Understand computer forensics workstations and software, Conduct an investigation, Complete a case, Critique a case, Network Forensics: open-source security tools for network forensic analysis, requirements for preservation of network data.	10	Apply (A), Analyse (An), Evaluate (E)
5	Mobile Forensics: mobile forensics techniques, mobile forensics tools. Legal Aspects of Digital Forensics: IT Act 2000, amendment of IT Act 2008.	08	Apply (A), Analyse (An)
6	Recent trends in mobile forensic technique and methods to search and seizure electronic evidence	04	Understand (U)

References:

1. John Sammons, The Basics of Digital Forensics, Elsevier
2. John Vacca, Computer Forensics: Computer Crime Scene Investigation, Laxmi Publications

M.E. Semester –II
Choice Based Credit Grading Scheme (CBCGS 2019)
Proposed Syllabus under Autonomy Scheme

ME (InformationTechnology)						SEM : II				
Course Name :Ethical Hacking						Course Code :2IT422				
Contact Hours Per Week : 03						Credits : 03				
Teaching Scheme (Program Specific)						Examination Scheme (Formative/ Summative)				
Modes of Teaching / Learning / Weightage						Modes of Continuous Assessment / Evaluation				
Hours Per Week						Theory (100)		Practical/Oral (25)	Term Work (25)	Total
Theory	Tutorial	Practical	Contact Hours	Credits		IA	ESE	PR	TW	
3	-	-	3	3		25	75	-	-	100

IA: In-Semester Assessment - Paper Duration – **1.5 Hours**
ESE : End Semester Examination - Paper Duration - **3 Hours**
The weightage of marks for continuous evaluation of Term work/Report: Formative (40%), Timely completion of Practical (40%) and Attendance (20%)

Prerequisite: Computer Programming, Web Programming, Computer Networks

Course objective:

Introduces the concepts of Ethical Hacking and gives the students the opportunity to learn about different tools and techniques in Ethical hacking and security and practically apply some of the tools.

Course Outcomes:

Sr. No.	Course Outcomes	Cognitive levels of attainment as per Bloom's Taxonomy
1	Understand the core concepts related to Ethical hacking, malware, hardware and software vulnerabilities and their causes	Remember (R),Understand (U),Analyse (An)
2	Understand ethics behind hacking and vulnerability disclosure	Remember (R),Understand (U),Analyse (An),Evaluate (E)
3	Appreciate the Cyber Laws and impact of hacking	Remember (R),Understand (U),Apply (A),Analyse (An), Evaluate (E)
4	Exploit the vulnerabilities related to computer system and networks using state of the art tools and technologies	Remember (R),Understand (U),Evaluate (E),Create (C)

Detailed syllabus:

Sr. No.	Detailed Content	Hours	Cognitive levels of attainment as per Bloom's Taxonomy
1	Introduction to Ethical Disclosure: Ethics of Ethical Hacking, Ethical Hacking and the legal system, Proper and Ethical Disclosure, Hacking Methodology, Information Gathering, Active and Passive Sniffing, Physical security vulnerabilities and countermeasures.	09	Remember (R),Understand (U),Analyse (An)
2	Internal and External testing. Preparation of Ethical Hacking and Penetration Test Reports and Documents and Tools: Using Metasploit, Using BackTrackLiveCDLinux Distribution	08	Remember (R),Understand (U),Apply (A)
3	Vulnerability Analysis: Passive Analysis, Advanced Static Analysis with IDA Pro, Advanced Reverse Engineering	09	Remember (R),Understand (U),Apply (A),Analyse (An)
4	Client-side browser exploits, Exploiting Windows Access Control Model forLocal Elevation Privilege, Intelligent Fuzzing with Sulley, From Vulnerability to Exploit	10	Remember (R),Understand (U),Apply (A),Analyse (An)
5	Malware Analysis: Collecting Malware and Initial Analysis, Hacking Malware	08	Remember (R),Understand (U),Analyse (An)
6	Case study of vulnerability of cloud platforms and mobile platforms & devices.	04	Remember (R),Understand (U),Apply (A),Analyse (An),Create (C)

References:

1. Shon Harris, Allen Harper, Chris Eagle and Jonathan Ness, Gray Hat Hacking: The Ethical Hackers' Handbook, TMH Edition
2. Jon Erickson, Hacking: The Art of Exploitation, SPD
3. Baloch, R., Ethical Hacking and Penetration Testing Guide, CRC Press, 2015.

M.E. Semester –II
Choice Based Credit Grading Scheme (CBCGS 2019)
Proposed Syllabus under Autonomy Scheme

ME (InformationTechnology)							SEM : II			
Course Name :Intrusion Detection							Course Code : 2IT423			
Contact Hours Per Week : 03							Credits : 03			
Teaching Scheme (Program Specific)						Examination Scheme (Formative/ Summative)				
Modes of Teaching / Learning / Weightage						Modes of Continuous Assessment / Evaluation				
Hours Per Week					Theory (100)		Practical/Oral (25)	Term Work (25)	Total	
Theory	Tutorial	Practical	Contact Hours	Credits	IA	ESE	PR	TW		
3	-	-	3	3	25	75	-	-	**100**	

IA: In-Semester Assessment - Paper Duration – **1.5 Hours**
ESE : End Semester Examination - Paper Duration - **3 Hours**
The weightage of marks for continuous evaluation of Term work/Report: Formative (40%), Timely completion of Practical (40%) and Attendance (20%)

Prerequisite: Computer Networks, Computer Programming

Course objective:

1. This course indented to deliver the fundamentals of intrusion detection system for computer network. It also classify various attacks on system and hence objective of this course is to focus on the preventive actions for attacks through IDS.
2. Compare alternative tools and approaches for Intrusion Detection through quantitative analysis to determine the best tool or approach to reduce risk from intrusion
3. Identify and describe the parts of all intrusion detection systems and characterize new and emerging IDS technologies according to the basic capabilities all intrusion detection systems share.

Course Outcomes:

Sr. No.	Course Outcomes	Cognitive levels of attainment as per Bloom's Taxonomy
1	Understand the fundamentals and history of Intrusion Detection in order to avoid common pitfalls in the creation	Remember (R),Understand (U)
2	Identify and classify attacks and design IDS as per case study.	Understand (U),Apply (A),Analyse (An)
3	Understand and apply knowledge for anlaysis network based IDS.	Understand (U),Apply (A),Analyse (An)
4	Classify and evaluate Anomaly Detection Systems and Algorithms	Understand (U),Analyse (An)
5	Analyze the threat using algorithms. Demonstrate Botnet attack	Remember (R),Understand (U),Apply (A),Analyse (An)
6	Understand and use snort tool to demonstrate the system , analyze and evaluate IDS	Apply (A),Analyse (An),Evaluate (E)

Detailed syllabus:

Sr. No.	Detailed Content	Hours	Cognitive levels of attainment as per Bloom's Taxonomy
1	The state of threats against computers, and networked systems-Overview of computer security solutions and why they fail-, VPN's -Overview of Intrusion Detection and Intrusion Prevention-Network and Host-based IDS	07	Remember (R),Understand (U)
2	Attacks & IDS technology Classes of attacks - Network layer: scans, denial of service, penetration- Application layer: software exploits, code injection-Components & Architecture-Typical components, Network Architectures Security capabilities -Information gathering capabilities, logging capabilities, detection & prevention capabilities	08	Understand (U),Apply (A),Analyse (An)
3	NETWORK BASED IDS: Networking Overview-OSI layers. Components and Architecture - Typical components, Network architectures and sensor locations. Security capabilities Wireless IDPS-Wireless Networking overview-WLAN standards & components. Components Network Behavior analysis system., Vulnerability assessment, penetration testing	08	Understand (U),Apply (A),Analyse (An)
4	Anomaly Detection Systems and Algorithms-Network Behavior Based Anomaly Detectors (rate based)-Host-based Anomaly Detectors-Software Vulnerabilities- State transition, Immunology, Payload Anomaly Detection	08	Understand (U),Analyse (An)
5	Attack trees and Correlation of alerts-Autopsy of Worms and Botnets-Malware detection-Obfuscation, polymorphism-Document vectors. Threat analysis in IDS using meaching learning algorithms	08	Remember (R),Understand (U),Apply (A),Analyse (An)
6	IDS TOOL : SNORT IDS Introduction to Snort, Working with Snort Rules, Snort configuration, Snort with MySQL, Running Snort on Multiple Network Interfaces, Snort Modes Snort Alert Modes, Snarf with Snort, Agent development for intrusion detection, Architecture models of IDS and IPS.Threat Analysis	08	Apply (A),Analyse (An),Evaluate (E)

References:

1. The Art of Computer Virus Research and Defense, Peter Szor, Symantec Press ISBN 0-321- 30545-3
2. Crimeware, Understanding New Attacks and Defenses, Markus Jakobsson and ZulfikarRamzan, Symantec Press, ISBN: 978-0-321-50195-0 2008
3. 4. Kerry J Cox , Christopher Gerg," Managing Security with Snort and IDS Tools", O'Reilly, 2007.
4. Rafeeq Rehman : ― Intrusion Detection with SNORT, Apache,MySQL, PHP and ACID,‖ 1st Edition, Prentice Hall , 2003
5. Carl Endorf, Eugene Schultz and Jim Mellander ― Intrusion Detection & Prevention‖, 1st Edition, Tata McGraw-Hill, 2006
6. Christopher Kruegel,Fredrik Valeur, Giovanni Vigna: ―Intrusion Detection and Correlation Challenges and Solutions‖, 1st Edition,Springer, 2005.

M.E. Semester –II
Choice Based Credit Grading Scheme (CBCGS 2019)
Proposed Syllabus under Autonomy Scheme

ME (Information Technology)							SEM : II			
Course Name : Sensor Networks and Internet of Things							**Course Code :** 2IT331			
Contact Hours Per Week : 03							**Credits** : 03			
Teaching Scheme (Program Specific)						**Examination Scheme (Formative/ Summative)**				
Modes of Teaching / Learning / Weightage						**Modes of Continuous Assessment / Evaluation**				
Hours Per Week						**Theory (100)**		**Practical/Oral (25)**	**Term Work (25)**	**Total**
Theory	Tutorial	Practical	Contact Hours	Credits	IA	ESE		PR	TW	
3	-	-	3	3	25	75		-	-	**100**
IA: In-Semester Assessment - Paper Duration – **1.5 Hours** **ESE :** End Semester Examination - Paper Duration - **3 Hours** **The weightage of marks for continuous evaluation of Term work/Report: Formative (40%), Timely completion of Practical (40%) and Attendance (20%)**										
Prerequisite: Databases, Probability										

Course objective:

1. The course gives an overview of various topics related to wireless sensor networks, which are expected to be the basis for the emerging internet-of-things.
2. The course covers topics with relation to various sub disciplines of computer science such as hardware, operating systems, distributed systems, networking, security and databases.
3. Able to understand wireless sensor network (WSN) specific issues such as localization, time synchronization, and topology control are addressed as well.

Course Outcomes:

Sr. No.	Course Outcomes	Cognitive levels of attainment as per Bloom's Taxonomy
1	Identify requirements from emerging WSN applications on WSN platforms, communication systems, protocols and middleware	Remember (R), Understand (U), Apply (A)
2	Understand, compare and evaluate communication and network protocols used in WSNs	Understand (U)
3	discuss and evaluate mechanisms and algorithms for time synchronization and localization in WSNs	Analyse (An), Evaluate (E)
4	Interrelate security and software engineering.	Apply (A), Analyse (An)

Detailed syllabus:

Module No.	Detailed Content	Hours	Cognitive levels of attainment as per Bloom's Taxonomy
1	Introduction and Applications: smart transportation, smart cities, smart living, smart energy, smart health, and smart learning. Examples of research areas include for instance: Self-Adaptive Systems, Cyber Physical Systems, Systems of Systems, Software Architectures and Connectors, Software Interoperability, Big Data and Big Data Mining, Privacy and Security	08	Remember (R), Understand (U)
2	IoT Reference Architecture- Introduction, Functional View, Information View, Deployment and Operational View, Other Relevant architectural views. Real-World Design Constraints- Introduction, Technical Design constraints- hardware, Data representation and visualization, Interaction and remote control.	09	Apply (A), Analyse (An)
3	Industrial Automation- Service-oriented architecture-based device integration, SOCRADES: realizing the enterprise integrated Web of Things, IMC-AESOP: from the Web of Things to the Cloud of Things, Commercial Building Automation- Introduction, Case study: phase one-commercial building automation today, Case study: phase two-commercial building automation in the future.	09	Apply (A), Analyse (An), Evaluate (E)
4	Hardware Platforms and Energy Consumption, Operating Systems, Time Synchronization, Positioning and Localization, Medium Access Control, Topology and Coverage Control, Routing: Transport Protocols, Network Security, Middleware, Databases	10	Understand (U), Apply (A)
5	IOT Physical Devices & Endpoints: What is an IOT Device, Exemplary Device Board, Linux on Raspberry , Interface and Programming & IOT Device	07	Understand (U), Apply (A)
6	Recent trends in sensor network and IOT architecture, Automation in Industrial aspect of IOT	05	Understand (U)

References:

1. Mandler, B., Barja, J., Mitre Campista, M.E., Cagá ová, D., Chaouchi, H., Zeadally, S., Badra, M., Giordano, S., Fazio
2. M., Somov, A., Vieriu, R.-L., Internet of Things. IoT Infrastructures, Springer International Publishing

M.E. Semester –II
Choice Based Credit Grading Scheme (CBCGS 2019)
Proposed Syllabus under Autonomy Scheme

ME (Information Technology)							SEM : II			
Course Name : IOT Applications and Communication Protocols							**Course Code :** 2IT333			
Contact Hours Per Week : 03							**Credits** : 03			
Teaching Scheme (Program Specific)						**Examination Scheme (Formative/ Summative)**				
Modes of Teaching / Learning / Weightage						**Modes of Continuous Assessment / Evaluation**				
Hours Per Week						**Theory (100)**		**Practical/Oral (25)**	**Term Work (25)**	**Total**
Theory	**Tutorial**	**Practical**	**Contact Hours**	**Credits**		**IA**	**ESE**	**PR**	**TW**	
3	-	-	3	3		25	75	-	-	**100**

IA: In-Semester Assessment - Paper Duration – **1.5 Hours**
ESE : End Semester Examination - Paper Duration - **3 Hours**
The weightage of marks for continuous evaluation of Term work/Report: Formative (40%), Timely completion of Practical (40%) and Attendance (20%)

Prerequisite: Databases, Probability

Course objective:

1. Basic introduction of all the elements of IoT-Mechanical, Electronics/sensor platform, Wireless and wireline protocols, Mobile to Electronics integration, Mobile to enterprise integration
2. Open source/commercial electronics platform for IoT-Raspberry Pi, Arduino , Arm Mbed LPC
3. Open source /commercial enterprise cloud platform for IoT-Ayla, iO Bridge, Libellium, Axeda, Cisco fog cloud

Course Outcomes:

Sr. No.	Course Outcomes	Cognitive levels of attainment as per Bloom's Taxonomy
1	To understand merging technological options, platforms and case studies of IoT implementation in home & city automation	Remember (R), Understand (U), Apply (A), Create (C)
2	Determine the Market perspective of IoT.	Remember (R), Understand (U), Analyse (An), Evaluate (E)

Detailed syllabus:

Module No.	Detailed Content	Hrs	Cognitive levels of attainment as per Bloom's Taxonomy
1	Basic function and architecture of a sensor — sensor body, sensor mechanism, sensor calibration, sensor maintenance, cost and pricing structure, legacy and modern sensor network.	09	Remember (R), Understand (U), Apply (A)

	Development of sensor electronics — IoT vs legacy, and open source vs traditional PCB design style Development of sensor communication protocols, Protocols: Modbus, relay, Zigbee, Zwave, X10, Bluetooth, ANT, etc. Business driver for sensor deployment — FDA/EPA regulation, fraud/tempering detection, supervision, quality control and process management Different kind of calibration Techniques: manual, automation, infield, primary and secondary calibration — and their implication in IoT Powering options for sensors: battery, solar, Witricity, Mobile and PoE		
2	Zigbee and Zwave — advantage of low power mesh networking. Long distance Zigbee. Introduction to different Zigbee chips. Bluetooth/BLE: Low power vs high power, speed of detection, class of BLE. Introduction of Bluetooth vendors & their review. Wireless protocols such as Piconet and packet structure for BLE and Zigbee Other long distance RF communication link. LOS vs NLOS links, Capacity and throughput calculation Application issues in wireless protocols: power consumption, reliability, PER, QoS, LOS	**09**	Understand (U), Apply (A), Evaluate (E), Create (C)
3	PCB vs FPGA vs ASIC design Prototyping electronics vs Production electronics QA certificate for IoT-CE/CSA/UL/IEC/RoHS/IP65 Basic introduction of multi-layer PCB design and its workflow Electronics reliability-basic concept of FIT and early mortality rate Environmental and reliability testing-basic concepts Basic Open source platforms: Arduino, Raspberry Pi, Beaglebone	**05**	Analyse (An), Evaluate (E), Create (C)
4	Introduction to Mobile app platform for IoT: Protocol stack of Mobile app for IoT, Mobile to server integration, iBeacon in IoS, Window Azure, Linkafy Mobile platform for IoT, Axeda, Xively	**08**	Remember (R), Understand (U), Analyse (An), Evaluate (E)
5	Database implementation for IoT : Cloud based IoT platforms, SQL vs NoSQL, Open sourced vs. Licensed Database, Available M2M cloud platform, AxedaXively, Omega NovoTech, Ayla Libellium, CISCO M2M platform, AT &T M2M platform, Google M2M platform	**08**	Understand (U), Apply (A), Evaluate (E), Create (C)
6	Recent trends in home automation, IOT-locks, Energy optimization in Home.	**05**	Analyse (An), Evaluate (E), Create (C)

References:

1. Olivier Hersent, David Boswarthick, Omar Elloumi,
2. The Internet of Things: Key Applications and Protocols, Wiley-Blackwell.

M.E. Semester –II
Choice Based Credit Grading Scheme (CBCGS 2019)
Proposed Syllabus under Autonomy Scheme

ME (InformationTechnology)							SEM : II		
Course Name : Network Security							**Course Code : 2IT432**		
Contact Hours Per Week : 03							**Credits** : 03		
Teaching Scheme (Program Specific)						**Examination Scheme (Formative/ Summative)**			
Modes of Teaching / Learning / Weightage						**Modes of Continuous Assessment / Evaluation**			
Hours Per Week						**Theory (100)**		**Practical/Oral (25)**	**Term Work (25)**	**Total**
Theory	**Tutorial**	**Practical**	**Contact Hours**	**Credits**	**IA**	**ESE**	**PR**	**TW**	
3	-	-	3	3	25	75	-	-	**100**

IA: In-Semester Assessment - Paper Duration – **1.5 Hours**
ESE : End Semester Examination - Paper Duration - **3 Hours**
The weightage of marks for continuous evaluation of Term work/Report: Formative (40%), Timely completion of Practical (40%) and Attendance (20%)

Prerequisite: Computer Networks, Web Programming

Course objective:

1. To learn the basics of security and various types of security issues.
2. To study different cryptography techniques available and various security attacks.
3. Explore network security and how they are implemented in real world.
4. To get an insight of various issues of Web security and biometric authentication.

Course Outcomes:

Sr. No.	Course Outcomes	Cognitive levels of attainment as per Bloom's Taxonomy
1	To have an understanding of basics of security and issues related to it.	Remember (R),Understand (U),Apply (A),Analyse (An)
2	Understanding of biometric techniques available and how they are used in today's world.	Remember (R),Understand (U),Apply (A)
3	Security issues in web and how to tackle them.	Remember (R),Understand (U),Apply (A),Analyse (An)
4	Learn mechanisms for transport and network security	Remember (R),Understand (U),Apply (A)

Detailed syllabus:

Sr. No.	Detailed Content	Hours	Cognitive levels of attainment as per Bloom's Taxonomy
1	Data security: Review of cryptography. Examples RSA, DES, ECC.	06	Remember (R),Understand (U),Apply (A)
2	Authentication, non-repudiation and message integrity. Digital signatures andcertificates. Protocols using cryptography (example Kerberos). Attacks on protocols	09	Remember (R),Understand (U),Apply (A),Analyse (An)
3	Network security: Firewalls, Proxy-Servers, Network intrusion detection, Honey pots. Transport security: Mechanisms of TLS, SSL, IPSec, Secure Email: PGP and S/MIME.Key Management.	09	Remember (R),Understand (U),Apply (A)
4	Web security – SQL injection, XSS, etc. Cross SiteScripting, Cross-Site Request Forgery, SessionHijacking and Management, Phishing and PharmingTechniques.Security.Software security and buffer overflow. Malware types and case studies.Access Control, firewalls and host/network intrusion detection.	11	Remember (R),Understand (U),Apply (A),Analyse (An)
5	Other topics: Biometric authentication, Secure E-Commerce (ex. SET), SmartCards, Security in Wireless Communication.	08	Remember (R),Understand (U),Apply (A),Analyse (An)
6	Recent trends inIOT security, Data security, End to End Security, IDS and Biometric.	05	Remember (R),Understand (U),Apply (A),Analyse (An)

References:

1. W. R. Cheswick and S. M. Bellovin. Firewalls and Internet Security. Addison Wesley, 1994.
2. W. Stallings. Cryptography and Network Security. Prentice Hall, 1999.
3. B. Schneier. Applied Cryptography. Wiley, 1999.

M.E. Semester –II
Choice Based Credit Grading Scheme (CBCGS 2019)
Proposed Syllabus under Autonomy Scheme

ME (Information Technology)					SEM : II				
Course Name : Malware Analysis and Reverse Engineering					Course Code : 2IT341				
Contact Hours Per Week : 03					Credits : 03				
Teaching Scheme (Program Specific)					Examination Scheme (Formative/ Summative)				
Modes of Teaching / Learning / Weightage					Modes of Continuous Assessment / Evaluation				
Hours Per Week					Theory (100)		Practical/Oral (25)	Term Work (25)	Total
Theory	Tutorial	Practical	Contact Hours	Credits	IA	ESE	PR	TW	
3	-	-	3	3	25	75	-	-	100

IA: In-Semester Assessment - Paper Duration – **1.5 Hours**
ESE : End Semester Examination - Paper Duration - **3 Hours**
The weightage of marks for continuous evaluation of Term work/Report: Formative (40%), Timely completion of Practical (40%) and Attendance (20%)

Prerequisite: Computer Programming, Compiler Design

Course objective:

The objective of this course is to provide an insight to fundamentals of malware analysis which includes analysis of JIT compilers for malware detection in legitimate code. DNS filtering and reverse engineering is included.

Course Outcomes:

Sr. No.	Course Outcomes	Cognitive levels of attainment as per Bloom's Taxonomy
1	To understand the concept of malware and reverse engineering.	Remember (R),Understand (U)
2	Implement tools and techniques of malware analysis	Apply (A),Analyse (An)

Detailed syllabus:

Module No.	Detailed Content	Hrs	Cognitive levels of attainment as per Bloom's Taxonomy
1	Fundamentals of Malware Analysis (MA), Reverse Engineering Malware (REM) Methodology, Brief Overview of Malware analysis lab setup and configuration, Introduction to key MA tools and techniques, Behavioral Analysis vs. Code Analysis, Resources for Reverse-Engineering Malware (REM) Understanding Malware Threats, Malware indicators, Malware Classification, Examining ClamAVSignatures, Creating Custom ClamAV Databases, Using YARA to Detect Malware Capabilities, Creating a Controlled and Isolated Laboratory, Introduction to MA Sandboxes,	12	Remember (R),Understand (U),Apply (A),Analyse (An)

	Ubuntu, Zeltser'sREMnux, SANS SIFT, Sandbox Setup and Configuration New Course Form, Routing TCP/IP Connections, Capturing and Analyzing Network Traffic, Internet simulation using INetSim, Using Deep Freeze to Preserve Physical Systems, Using FOG for Cloning and Imaging Disks, Using MySQL Database to Automate FOG Tasks, Introduction to Python ,Introduction to x86 Intel assembly language, Scanners: Virus Total, Jotti, and NoVirus Thanks, Analyzers: Threat Expert, CWSandbox, Anubis, Joebox, Dynamic Analysis Tools: Process Monitor, Regshot, HandleDiff, Analysis Automation Tools: Virtual Box, VM Ware, Python , Other Analysis Tools		
2	**Malware Forensics** Using TSK for Network and Host Discoveries, Using Microsoft Offline API to Registry Discoveries , Identifying Packers using PEiD, Registry Forensics with Reg Ripper Plu-gins:, Bypassing Poison Ivy's Locked Files, Bypassing Conficker's File System ACL Restrictions, Detecting Rogue PKI Certificates.	07	Remember (R),Understand (U),Apply (A),Analyse (An)
3	**Malware and Kernel Debugging** Opening and Attaching to Processes, Configuration of JIT Debugger for Shellcode Analysis, Controlling Program Execution, Setting and Catching Breakpoints, Debugging with Python Scripts and Py Commands, DLL Export Enumeration, Execution, and Debugging, Debugging a VMware Workstation Guest (on Windows), Debugging a Parallels Guest (on Mac OS X). Introduction to WinDbg Commands and Controls, Detecting Rootkits with WinDbgScripts, Kernel Debugging with IDA Pro.	09	Remember (R),Understand (U),Apply (A),Analyse (An)
4	**Memory Forensics and Volatility** Memory Dumping with MoonSols Windows Memory Toolkit, Accessing VM Memory Files Overview of Volatility, Investigating Processes in Memory Dumps, Code Injection and Extraction, Detecting and Capturing Suspicious Loaded DLLs, Finding Artifacts in Process Memory, Identifying Injected Code with Malfind and YARA.	08	Remember (R),Understand (U),Apply (A),Analyse (An)
5	**Researching and Mapping Source Domains/IPs** Using WHOIS to Research Domains, DNS Hostname Resolution, Querying Passive DNS, Checking DNS Records, Reverse IP Search New Course Form, Creating Static Maps, Creating Interactive Maps.	07	Remember (R),Understand (U),Apply (A),Analyse (An)
6	Case study of Finding Artifacts in Process Memory, Identifying Injected Code with Malfind and YARA	05	Remember (R),Understand (U),Apply (A)

References:

1. Michael Sikorski, Andrew Honig "Practical Malware Analysis: The Hands-On Guide to Dissecting Malicious Software" publisher William Pollock

M.E. Semester –II
Choice Based Credit Grading Scheme (CBCGS 2019)
Proposed Syllabus under Autonomy Scheme

ME (InformationTechnology)					SEM : II				
Course Name : Block Chain Technology -I					Course Code : 2IT441				
Contact Hours Per Week : 03					Credits : 03				
Teaching Scheme (Program Specific)					Examination Scheme (Formative/ Summative)				
Modes of Teaching / Learning / Weightage					Modes of Continuous Assessment / Evaluation				
Hours Per Week					Theory (100)		Practical/Oral (25)	Term Work (25)	Total
Theory	Tutorial	Practical	Contact Hours	Credits	IA	ESE	PR/OR	TW	
3	-	-	3	3	25	75	-	-	**100**

IA: In-Semester Assessment - Paper Duration – **1.5 Hours**

ESE : End Semester Examination - Paper Duration - **3 Hours**

The weightage of marks for continuous evaluation of Term work/Report: Formative (40%), Timely completion of Practical (40%) and Attendance (20%)

Prerequisite: Cryptography Techniques, Data Structures and Algorithms, Introduction to Programming

Course objective:

1. The objective of this course is to provide conceptual understanding of how block chain technology can be used to innovate and improve business processes.
2. The course covers the technological underpinning of block Chain operations in both theoretical and practical implementation of solutions using block Chain technology.

Course Outcomes:

Sr. No.	Course Outcomes	Cognitive levels of attainment as per Bloom's Taxonomy
1	Understand block chain technology.	Understand
2	Develop block chain based solutions and write smart contract using Hyper ledger Fabric and Ethereal frameworks.	Apply , Analyze, Evaluate
3	Build and deploy block chain application for on premise and cloud based architecture.	Apply , Analyze, Evaluate, Create
4	Integrate ideas from various domains and implement them using block chain technology in different perspectives.	Apply , Analyze, Evaluate, Create

Detailed syllabus:

Sr. No.	Detailed Content	Hours	Cognitive levels of attainment as per Bloom's Taxonomy
1	Introduction: Overview of Block chain, Public Ledgers, Bitcoin, Smart Contracts, Block in a Block chain, Transactions, Distributed Consensus, Public vs Private Block chain, Understanding Crypto currency to Block chain, Permissioned Model of Block chain, Overview of Security aspects of Block chain	04	Remember, Understand, Apply
2	Basic Crypto Primitives: Cryptographic Hash Function, Properties of a hash function, Hash pointer and Merkle tree, Digital Signature, Public Key Cryptography, A basic cryptocurrency.	02	Remember, Understand, Apply
3	Understanding Block chain with Crypto currency Bitcoin and Block chain: Creation of coins, Payments and double spending, Bitcoin Scripts, Bitcoin P2P Network, Transaction in Bitcoin Network, Block Mining, Block propagation and block relay. Working with Consensus in Bitcoin: Distributed consensus in open environments, Consensus in a Bitcoin network, Proof of Work (PoW) – basic introduction, Hashcash PoW, Bitcoin PoW, Attacks on PoW and the monopoly problem, Proof of Stake, Proof of Burn and Proof of Elapsed Time, The life of a Bitcoin Miner, Mining Difficulty, Mining Pool.	09	Remember, Understand, Apply , Analyze
4	Understanding Block chain for Enterprises Permissioned Block chain: Permissioned model and use cases, Design issues for permissioned block chains, Execute contracts, State machine replication, Overview of Consensus models for permissioned block chain-Distributed consensus in closed environment, Paxos, RAFT Consensus, Byzantine general problem, Byzantine fault tolerant system, Lamport-Shostak-Pease BFT Algorithm, BFT over Asynchronous systems.	08	Remember, Understand, Apply , Analyze
5	Enterprise application of Block chain: Cross border payments, Know Your Customer (KYC), Food Security, Mortgage over Block chain, Block chain enabled Trade, We Trade – Trade Finance Network, Supply Chain Financing, Identity on Block chain	04	Apply , Analyze, Evaluate
6	Block chain application development Hyperledger Fabric-rchitecture, Identities and Policies, Membership and Access Control, Channels, Transaction Validation, Writing smart contract using yperledger Fabric, Writing smart contract using Ethereum, Overview of Ripple and Corda	18	Understand, Apply , Analyze

References:

1. James, G., Witten, D., Hastie, T., Tibshirani, R. An introduction to statistical learning with applications in R. Springer, 2013.
2. Data Mining Concepts and Techniques, Third Edition, Jiawei Han, MichelineKamber, Jian Pei, Morgan Kaufmann
3. "Data Science for business", F. Provost, T Fawcett, 2013
4. Cathy O'Neil and Rachel Schutt. Doing Data Science, Straight Talk From The Frontline. O'Reilly. 2014.

M.E. Semester –II
Choice Based Credit Grading Scheme (CBCGS 2019)
Proposed Syllabus under Autonomy Scheme

ME (InformationTechnology)		SEM : II	
Course Name :Distributed database		Course Code : 2IT442	
Contact Hours Per Week : 03		Credits : 03	
Teaching Scheme (Program Specific)		Examination Scheme (Formative/ Summative)	
Modes of Teaching / Learning / Weightage		Modes of Continuous Assessment / Evaluation	

Hours Per Week					Theory (100)		Practical/Oral (25)	Term Work (25)	Total
Theory	Tutorial	Practical	Contact Hours	Credits	IA	ESE	PR/OR	TW	
3	-	-	3	3	25	75	-	-	100

IA: In-Semester Assessment - Paper Duration – **1.5 Hours**
ESE : End Semester Examination - Paper Duration - **3 Hours**
The weightage of marks for continuous evaluation of Term work/Report: Formative (40%), Timely completion of Practical (40%) and Attendance (20%)

Prerequisite: Computer Basics, Procedural Programming Languages

Course objective:

The objective of course is to provide insight to distributed database, normalization techniques and integrity rules. It also includes parallel database systems along with object oriented models.

Course Outcomes:

Sr. No.	Course Outcomes	Cognitive levels of attainment as per Bloom's Taxonomy
1	Able to understand relational database management systems,	Analyze (AN) Evaluate (E)
2	Normalization to make efficient retrieval from database and query.	Analyze (AN) Evaluate (E)

Detailed syllabus:

Module No.	Detailed Content	Hours	Cognitive levels of attainment as per Bloom's Taxonomy
1	Introduction: Overview of client - server architecture and its relationship to distributed databases, Distributed Data processing, Distributed database system (DDBMS), Promises of DDBMSs, Complicating factors and Problem areas in DDBMSs, Overview Of Relational DBMS Relational Database concepts, Normalization, Integrity rules, Relational Data	11	Analyze (AN)

	Languages, Concurrency control Heterogeneity issues, Persistent Programming Languages		
2	Distributed DBMS Architecture: DBMS Standardization, Architectural models for Distributed DBMS, Distributed DBMS Architecture. Distributed Database Design: Alternative design Strategies, Distribution design issues, Fragmentation, Allocation. Semantic Data Control: View Management, Data security, Semantic Integrity control	**08**	Analyze (AN) Evaluate (E)
3	Overview of Query Processing: Query processing problem, Objectives of Query Processing, Complexity of Relational Algebra operations, characterization of Query processors, Layers of Query Processing. Introduction to Transaction Management: Definition of Transaction, Properties of transaction, types of transaction. Distributed Concurrency Control: Serializability theory, Taxonomy of concurrency control mechanisms, locking bases concurrency control algorithms.,	**09**	Analyze (AN)
4	Parallel Database Systems: Database servers, Parallel architecture, Parallel DBMStechniques, Parallel execution problems, Parallel execution for hierarchical architecture, shared nothing/shared disk/shared memory based architectures, Data partitioning, Pipelining, Scheduling, Load balancing	**07**	Analyze (AN)
5	Distributed Object Database Management systems: Fundamental Object concepts and Object models, Object distribution design. Architectural issues, Object management, Distributed object storage, Object query processing. Transaction management. Database Interoperability: Database Integration, Query processing	**08**	Apply (A)
6	Recent approaches, models and current trends in improving the performance of Distributed Database.	**05**	Analyze (AN)

References:

1. Christopher M. Bishop, Pattern Recognition and Machine Learning.
2. John Shawe-Taylor and NelloCristianini, Kernel Methods for Pattern Analysis.

M.E. Semester –II
Choice Based Credit Grading Scheme (CBCGS 2019)
Proposed Syllabus under Autonomy Scheme

ME (InformationTechnology)							SEM : II		
Course Name : Secure Software Design and Enterprise Computing							**Course Code : 2IT443**		
Contact Hours Per Week : 03							**Credits** : 03		
Teaching Scheme (Program Specific)						**Examination Scheme (Formative/ Summative)**			
Modes of Teaching / Learning / Weightage						**Modes of Continuous Assessment / Evaluation**			
Hours Per Week					**Theory (100)**		**Practical/Oral (25)**	**Term Work (25)**	**Total**
Theory	**Tutorial**	**Practical**	**Contact Hours**	**Credits**	**IA**	**ESE**	**PR/OR**	**TW**	
3	-	-	3	3	25	75	-	-	**100**

IA: In-Semester Assessment - Paper Duration – **1.5 Hours**
ESE : End Semester Examination - Paper Duration - **3 Hours**
The weightage of marks for continuous evaluation of Term work/Report: Formative (40%), Timely completion of Practical (40%) and Attendance (20%)

Prerequisite: Computer Programming, Software Engineering

Course objective:

1. To fix software flaws and bugs in various software.
2. To make students aware of various issues like weak random number generation, information leakage, poor usability, and weak or no encryption on data traffic
3. Techniques for successfully implementing and supporting network services on an enterprise scale and heterogeneous systems environment.
4. Methodologies and tools to design and develop secure software containing minimum vulnerabilities and flaws.

Course Outcomes:

Sr. No.	Course Outcomes	Cognitive levels of attainment as per Bloom's Taxonomy
1	Differentiate between various software vulnerabilities.	Remember, Understand, Apply
2	Software process vulnerabilities for an organization.	Remember, Understand Apply, Analyze
3	Monitor resources consumption in a software.	Remember, Understand Apply, Analyse
4	Interrelate security and software development process.	Remember, Understand Apply, Analyse

Detailed syllabus:

Sr. No.	Detailed Content	Hrs	Cognitive levels of attainment as per Bloom's Taxonomy
1	**Secure Software Design** Identify software vulnerabilities and perform software security analysis, Mastersecurity programming practices, Master fundamental software security design concepts, Perform security testing and quality assurance. Secure software implementation, deployment and ongoing management	04	Remember, Understand Apply,
2	**Enterprise Application Development** Describe the nature and scope of enterprise software applications, Design distributed N-tier software application, Research technologies available for the presentation, business and data tiers of an enterprise software application, Design and build a database using an enterprise database system, Develop components at the different tiers in an enterprise system, Design and develop a multi-tier solution to a problem using technologies used in enterprise system, Present software solution.	10	Remember, Understand Apply, Analyse, Evaluate
3	**Enterprise Systems Administration** Design, implement and maintain a directory-based server infrastructure in a heterogeneous systems environment, Monitor server resource utilization for system reliability and availability, Install and administer network services (DNS/DHCP/Terminal Services/Clustering/Web/Email).Identification and authentication, enterprise information security, symmetric and asymmetric cryptography, including public key cryptography, data encryption standard (DES), advanced encryption standard (AES), algorithm for hashes and message digests.	10	Remember, Understand, Apply, Analyse, Evaluate
4	**Software Security in Enterprise Business** Obtain the ability to manage and troubleshoot a network running multiple services, Understand the requirements of an enterprise network and how to go about managing them.Authentication, authentication schemes, access control models, Kerberos protocol, public key infrastructure (PKI), protocols designed for e-commerce and web applications	08	Remember, Understand, Apply, Analyse
5	**Software secure systems** Handle insecure exceptions and command/SQL injection, Defend web and mobile applications against attackers, software containing minimum vulnerabilities and flaws. Security systems designed firewalls and VPNs, management issues, technologies, system related to information security management at enterprise.	08	Remember, Understand Apply
6	**Software Assurance Models** Identify project security risk & selecting risk management strategies, Risk management framework, Security best practices/known security flaws, architectural risk analysis, security testing & reliability (Penn testing, Risk-Based security testing, Abuse cases, operational testing) , Case study of DNS server, DHCP configuration and SQL injection attack.	08	Remember, Understand Apply, Analyse

References:

1. Theodor Richardson, Charles N Thies, Secure Software Design, Jones & Bartlett
2. Kenneth R. van Wyk, Mark G. Graff, Dan S. Peters, Diana L. Burley, Enterprise Software Security, Addison Wesley.
3. W.Stallings, Cryptography and network security: Principles and practice, 5th edition, Upper Saddle River, Prentice Hall,2011
4. 4. C.Kaufman, R.Perlman&M.Spenicer, Network security: Private communication in a public world, 2ndEdition,Upper Saddle River, NJ:Prentice Hall, 2002
5. Gary McGraw, Software Security: Building Security In , Addison Wesley, 2006

Online References:

https://www.dwheeler.com/secure-class/ by David A.Wheeler

https://www.coursera.org/lecture/software-design-threats-mitigations/secure-software-design-is-good-software design-dXAT3 by Alert Glock

M.E. Semester –II
Choice Based Credit Grading Scheme (CBCGS 2019)
Proposed Syllabus under Autonomy Scheme

ME (Information Technology)							SEM : II		
Course Name : English for research paper writing							**Course Code :**2AAE1		
Teaching Scheme (Program Specific)						**Examination Scheme (Formative/ Summative)**			
Modes of Teaching / Learning / Weightage						**Modes of Continuous Assessment / Evaluation**			
Hours Per Week						**Theory (100)**	**Practical/Oral (25)**	**Term Work (50)**	**Total**
Theory	**Tutorial**	**Practical**	**Contact Hours**	**Credits**	**IA**	**ESE**	**PR/OR**	**TW**	
2	-	-	2	-	-	-	-	50	**50**
IA: In Semester Assessment **ESE :** End Semester Examination **The weightage of marks for continuous evaluation of Term work/Report: Formative (40%), Timely completion of Assignment (40%) and Attendance (20%)**									

Course objectives:
1. Understand that how to improve your writing skills and level of readability
2. Learn about what to write in each section
3. Understand the skills needed when writing a Title
4. Ensure the good quality of paper at very first-time submission

Sr. No.	Topics	Hrs.
1	Planning and Preparation, Word Order, Breaking up long sentences, Structuring Paragraphs and Sentences, Being Concise and Removing Redundancy, Avoiding Ambiguity and Vagueness	4
2	Clarifying Who Did What, Highlighting Your Findings, Hedging and Criticising, Paraphrasing and Plagiarism, Sections of a Paper, Abstracts. Introduction	4
3	Review of the Literature, Methods, Results, Discussion, Conclusions, The Final Check.	4
4	Key skills are needed when writing a Title, key skills are needed when writing an Abstract, key skills are needed when writing an Introduction, skills needed when writing a Review of the Literature,	4
5	Skills are needed when writing the Methods, skills needed when writing the Results, skills are needed when writing the Discussion, skills are needed when writing the Conclusions	4
6	Useful phrases, how to ensure paper is as good as it could possibly be the first- time submission	4

Reference Books:

1. Goldbort R (2006) Writing for Science, Yale University Press (available on Google Books).
2. Day R (2006) How to Write and Publish a Scientific Paper, Cambridge University Press
3. Highman N (1998), Handbook of Writing for the Mathematical Sciences, SIAM. Highman's book.
4. Adrian Wall work, English for Writing Research Papers, Springer New York Dordrecht
   Heidelberg London, 2011

M.E. Semester –II
Choice Based Credit Grading Scheme (CBCGS 2019)
Proposed Syllabus under Autonomy Scheme

ME (Information Technology)							SEM : II		
Course Name : Disaster management							**Course Code :** 2AAE2		
Teaching Scheme (Program Specific)						**Examination Scheme (Formative/ Summative)**			
Modes of Teaching / Learning / Weightage						**Modes of Continuous Assessment / Evaluation**			
Hours Per Week					**Theory (100)**		**Practical/Oral (25)**	**Term Work (50)**	**Total**
Theory	**Tutorial**	**Practical**	**Contact Hours**	**Credits**	**IA**	**ESE**	**PR/OR**	**TW**	
2	-	-	2	-	-	-	-	50	**50**
IA: In Semester Assessment **ESE :** End Semester Examination **The weightage of marks for continuous evaluation of Term work/Report: Formative (40%), Timely completion of Assignment (40%) and Attendance (20%)**									

Course objectives:
1. Learn to demonstrate a critical understanding of key concepts in disaster risk reduction and humanitarian response.

2. Critically evaluate disaster risk reduction and humanitarian response policy and practice from multiple perspectives.

3. Develop an understanding of standards of humanitarian response and practical relevance in specific types of disasters and conflict situations
.
4. Critically understand the strengths and weaknesses of disaster management approaches, planning and programming in different countries, particularly their home country or the countries they work in

Module No.	Topics	Hrs.
1	**Introduction:** Disaster: Definition, Factors And Significance; Difference Between Hazard And Disaster; Natural And Manmade Disasters: Difference, Nature, Types And Magnitude.	4
2	**Repercussions Of Disasters And Hazards:** Economic Damage, Loss Of Human And Animal Life, Destruction Of Ecosystem. Natural Disasters: Earthquakes, Volcanisms, Cyclones, Tsunamis, Floods, Droughts And Famines, Landslides And Avalanches, Man-made disaster: Nuclear Reactor Meltdown, Industrial Accidents, Oil Slicks And Spills, Outbreaks Of Disease And Epidemics, War And Conflicts.	4
3	**Disaster Prone Areas In India:** Study Of Seismic Zones; Areas Prone To Floods And Droughts, Landslides And Avalanches; Areas Prone To Cyclonic And Coastal Hazards With Special Reference To Tsunami; Post-Disaster Diseases And Epidemics	4
4	**Disaster Preparedness And Management:** Preparedness: Monitoring Of Phenomena Triggering A Disaster Or Hazard; Evaluation Of Risk: Application Of Remote Sensing, Data From Meteorological And Other Agencies, Media Reports: Governmental And Community Preparedness	4

5	**Risk Assessment:** Disaster Risk: Concept And Elements, Disaster Risk Reduction, Global And National Disaster Risk Situation. Techniques Of Risk Assessment, Global-Operation In Risk Assessment And Warning, People's Participation In Risk Assessment. Strategies for Survival.	4
6	**Disaster Mitigation:** Meaning, Concept And Strategies Of Disaster Mitigation, Emerging Trends In Mitigation. Structural Mitigation And Non-Structural Mitigation, Programs Of Disaster Mitigation In India.	4

Reference Books:
1. R. Nishith, Singh AK, "Disaster Management in India: Perspectives, issues and strategies "'New Royal book Company.
2. Sahni, Pardeep Et.Al. (Eds.)," Disaster Mitigation Experiences and Reflections", Prentice Hall Of India, New Delhi.
3. Goel S. L., Disaster Administration And Management Text And Case Studies" ,Deep &Deep Publication Pvt. Ltd., New Delhi

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M.E. Semester –II
Choice Based Credit Grading Scheme (CBCGS 2019)
Proposed Syllabus under Autonomy Scheme

ME (Information Technology)							SEM: II		
Course Name: Sanskrit for technical knowledge							**Course Code:** 2AAE3		
Teaching Scheme (Program Specific)						**Examination Scheme (Formative/ Summative)**			
Modes of Teaching / Learning / Weightage						**Modes of Continuous Assessment / Evaluation**			
Hours Per Week					**Theory (100)**		**Practical/Oral (25)**	**Term Work (50)**	**Total**
Theory	**Tutorial**	**Practical**	**Contact Hours**	**Credits**	**IA**	**ESE**	**PR/OR**	**TW**	
2	-	-	2	-	-	-	-	50	**50**
IA: In Semester Assessment									
ESE: End Semester Examination									
The weightage of marks for continuous evaluation of Term work/Report: Formative (40%), Timely completion of Assignment (40%) and Attendance (20%)									

Course objectives:
1. To get a working knowledge in illustrious Sanskrit, the scientific language in the world
2. Learning of Sanskrit to improve brain functioning
3. Learning of Sanskrit to develop the logic in mathematics, science & other subjects
4. Enhancing the memory power.
5. The engineering scholars equipped with Sanskrit will be able to explore the
6. Huge knowledge from ancient literature.

Course outcomes: Students should be able to:
1. Understanding basic Sanskrit language
2. Ancient Sanskrit literature about science & technology can be understood
3. Being a logical language will help to develop logic in students

Module No.	Topics	Hrs.
1	Alphabets in Sanskrit, Past/Present/Future Tense, Simple Sentences	8
2	Order, Introduction of roots, Technical information about Sanskrit Literature.	8
3	Technical concepts of Engineering-Electrical, Mechanical, Architecture, Mathematics	8

Reference Books:
1. "Abhyaspustakam" – Dr.Vishwas, Samskrita-Bharti Publication, New Delhi
2. "Teach Yourself Sanskrit" Prathama Deeksha-Vempati Kutumbshastri, Rashtriya Sanskrit Sansthanam, New Delhi Publication
3. "India's Glorious Scientific Tradition" Suresh Soni, Ocean books (P) Ltd., New Delhi.

M.E. Semester –II
Choice Based Credit Grading Scheme (CBCGS 2019)
Proposed Syllabus under Autonomy Scheme

ME (Information Technology)								SEM : II	
Course Name : Value Education								**Course Code :**2AAE4	
Teaching Scheme (Program Specific)						**Examination Scheme (Formative/ Summative)**			
Modes of Teaching / Learning / Weightage						**Modes of Continuous Assessment / Evaluation**			
Hours Per Week					**Theory (100)**		**Practical/Oral (25)**	**Term Work (50)**	**Total**
Theory	**Tutorial**	**Practical**	**Contact Hours**	**Credits**	**IA**	**ESE**	**PR/OR**	**TW**	
2	-	-	2	-	–	–	–	50	50
IA: In Semester Assessment **ESE :** End Semester Examination **The weightage of marks for continuous evaluation of Term work/Report: Formative (40%), Timely completion of Assignment (40%) and Attendance (20%)**									

Course Objective:

Students should be able to

1. Understand value of education and self- development

2. Understand the importance of character

3. Imbibe good values in students

Course Outcomes:

S. No.	Course Outcomes	Cognitive levels as per Bloom's Taxonomy
1	Understand value of education and self- development	Apply (A)
2	Understand the importance of character	Apply (A)
3	Imbibe good values in students creating good human beings	Create(C)

Detailed Content:

Module No.	Topics	Hrs.	Cognitive levels as per Bloom's Taxonomy
1	Values and self-development –Social values and individual attitudes. Work ethics, Indian vision of humanism. Moral and non- moral valuation. Standards and principles. Value judgments	6	Apply (A)

2	Importance of cultivation of values. Sense of duty. Devotion, Self-reliance. Confidence, Concentration. Truthfulness, Cleanliness. Honesty, Humanity. Power of faith, National Unity. Patriotism. Love for nature ,Discipline	6	Apply (A)
3	Personality and Behavior Development - Soul and Scientific attitude. Positive Thinking. Integrity and discipline. Punctuality, Love and Kindness. Avoid fault Thinking. Free from anger, Dignity of labour. Universal brotherhood and religious tolerance. True friendship. Happiness Vs suffering, love for truth. Aware of self-destructive habits. Association and Cooperation.	6	Apply (A)
4	Character and Competence –Holy books vs Blind faith. Self-management and Good health. Science of reincarnation. Equality, Nonviolence, Humility, Role of Women. All religions and same message. Mind your Mind, Self-control.	6	Apply (A)

Reference Books:

1. Chakroborty, S.K. "Values and Ethics for organizations Theory and practice", Oxford University Press, New Delhi

M.E. Semester –II
Choice Based Credit Grading Scheme (CBCGS 2019)
Proposed Syllabus under Autonomy Scheme

ME (Information Technology)							SEM: II			
Course Name: Constitution of India							**Course Code:**2AAE5			
Teaching Scheme (Program Specific)						**Examination Scheme (Formative/ Summative)**				
Modes of Teaching / Learning / Weightage						**Modes of Continuous Assessment / Evaluation**				
Hours Per Week						**Theory (100)**		**Practical/Oral (25)**	**Term Work (50)**	**Total**
Theory	**Tutorial**	**Practical**	**Contact Hours**	**Credits**	**IA**	**ESE**		**PR/OR**	**TW**	**50**
2	-	-	2	-	-	-		-	50	
IA: In Semester Assessment										
ESE : End Semester Examination **The weightage of marks for continuous evaluation of Term work/Report: Formative (40%), Timely completion of Assignment (40%) and Attendance (20%)**										

Course objectives:

1. Understand the premises informing the twin themes of liberty and freedom from a civil right perspective.
2. To address the growth of Indian opinion regarding modern Indian intellectuals' constitutional role and entitlement to civil and economic rights as well as the emergence of nationhood in the early years of Indian nationalism.
3. To address the role of socialism in India after the commencement of the Bolshevik Revolution in 1917 and its impact on the initial drafting of the Indian Constitution

Course Outcomes: Students will be able to:

1. Discuss the growth of the demand for civil rights in India for the bulk of Indians before the arrival of Gandhi in Indian politics.

2. Discuss the intellectual origins of the framework of argument that informed the conceptualization of social reforms leading to revolution in India.

3. Discuss the circumstances surrounding the foundation of the Congress Socialist Party [CSP] under the leadership of Jawaharlal Nehru and the eventual failure of the proposal of direct elections through adult suffrage in the Indian Constitution.

4. Discuss the passage of the Hindu Code Bill of 1956.

Module No.	Topics	Hrs.
1	**History of Making of the Indian Constitution:** History Drafting Committee, (Composition & Working)	4
2	**Philosophy of the Indian Constitution:** Preamble Salient Features	4
3	**Contours of Constitutional Rights & Duties:** Fundamental Rights Right to Equality Right to Freedom Right against Exploitation Right to Freedom of Religion Cultural and Educational Rights Right to Constitutional Remedies Directive Principles of State Policy Fundamental Duties	4
4	**Organs of Governance:** Parliament Composition Qualifications and Disqualifications Powers and Functions Executive President Governor Council of Ministers Judiciary, Appointment and Transfer of Judges, Qualifications Powers and Functions	4
5	**Local Administration:** District's Administration head: Role and Importance, Municipalities: Introduction, Mayor and role of Elected Representative, CEO of Municipal Corporation. Pachayati raj: Introduction, PRI: Zila Pachayat. Elected officials and their roles, CEO Zila Pachayat: Position and role. Block level: Organizational Hierarchy (Different departments), Village level: Role of Elected and Appointed officials, Importance of grass root democracy	4
6	**Election Commission:** Election Commission: Role and Functioning. Chief Election Commissioner and Election Commissioners. State Election Commission: Role and Functioning. Institute and Bodies for the welfare of SC/ST/OBC and women	4

Reference Books:
1. The Constitution of India, 1950 (Bare Act), Government Publication.
2. Dr. S. N. Busi, Dr. B. R. Ambedkar framing of Indian Constitution, 1st Edition, 2015.
3. M. P. Jain, Indian Constitution Law, 7th Edn., Lexis Nexis, 2014.
4. D.D. Basu, Introduction to the Constitution of India, Lexis Nexis, 2015.

M.E. Semester –II
Choice Based Credit Grading Scheme (CBCGS 2019)
Proposed Syllabus under Autonomy Scheme

ME (Information Technology)								SEM: II	
Course Name: Pedagogy studies								**Course Code:**2AAE6	
Teaching Scheme (Program Specific)					**Examination Scheme (Formative/ Summative)**				
Modes of Teaching / Learning / Weightage					**Modes of Continuous Assessment / Evaluation**				
Hours Per Week					**Theory (100)**		**Practical/Oral (25)**	**Term Work (50)**	**Total**
Theory	**Tutorial**	**Practical**	**Contact Hours**	**Credits**	**IA**	**ESE**	**PR/OR**	**TW**	
2	-	-	2	-	-	-	-	50	**50**
IA: In Semester Assessment									
ESE : End Semester Examination									
The weightage of marks for continuous evaluation of Term work/Report: Formative (40%), Timely completion of Assignment (40%) and Attendance (20%)									

Course objectives:

1. Review existing evidence on the review topic to inform programme design and policy making undertaken by the DfID, other agencies and researchers.

2. Identify critical evidence gaps to guide the development.

Detail Content:

Sr. No.	Topics	Hrs.
1	**Introduction and Methodology:** Aims and rationale, Policy background, Conceptual framework and terminology Theories of learning, Curriculum, Teacher education. Conceptual framework, Research questions**.** Overview of methodology and Searching	4
2	**Thematic overview:** Pedagogical practices are being used by teachers in formal and informal classrooms in developing countries. Curriculum, Teacher education	2
3	Evidence on the effectiveness of pedagogical practices Methodology for the in depth stage: quality assessment of included studies. How can teacher education (curriculum and practicum) and the school curriculum and guidance materials best support effective pedagogy? Theory of change. Strength and nature of the body of evidence for effective pedagogical practices. Pedagogic theory and pedagogical approaches. Teachers' attitudes and beliefs and Pedagogic strategies	4
4	**Professional development:** alignment with classroom practices and follow- up support Peer support Support from the head teacher and the community. Curriculum and assessment Barriers to learning: limited resources and large class sizes	4

5	**Research gaps and future directions:** Research design Contexts Pedagogy Teacher education Curriculum and assessment Dissemination and research impact	2

Reference Books:

1. Ackers J, Hardman F (2001) Classroom interaction in Kenyan primary schools, Compare, 31 (2):245-261.
2. Agrawal M (2004) curricular reform in schools: The importance of evaluation, Journal of Curriculum Studies, 36 (3): 361-379.
3. Akyeampong K (2003) Teacher training in Ghana - does it count? Multi-site teacher education research project (MUSTER) country report 1. London: DFID.
4. Akyeampong K, Lussier K, Pryor J, Westbrook J (2013) Improving teaching and learning of basic maths and reading in Africa: Does teacher preparation count? International Journal Educational Development, 33 (3): 272–282.
5. Alexander RJ (2001) Culture and pedagogy: International comparisons in primary education. Oxford and Boston: Blackwell.
6. Chavan M (2003) Read India: A mass scale, rapid, 'learning to read' campaign.
7. www.pratham.org/images/resource%20working%20paper%202.pdf.

M.E. Semester –II
Choice Based Credit Grading Scheme (CBCGS 2019)
Proposed Syllabus under Autonomy Scheme

ME (Information Technology)							SEM: II		
Course Name: Stress management by yoga							**Course Code:**2AAE7		
Teaching Scheme (Program Specific)						**Examination Scheme (Formative/ Summative)**			
Modes of Teaching / Learning / Weightage						**Modes of Continuous Assessment / Evaluation**			
Hours Per Week					**Theory (100)**		**Practical/Oral (25)**	**Term Work (50)**	**Total**
Theory	**Tutorial**	**Practical**	**Contact Hours**	**Credits**	**IA**	**ESE**	**PR/OR**	**TW**	
2	-	-	2	-	-	-	-	50	**50**
IA: In Semester Assessment									
ESE : End Semester Examination									
The weightage of marks for continuous evaluation of Term work/Report: Formative (40%), Timely completion of Assignment (40%) and Attendance (20%)									

Course objectives:
1. To achieve overall health of body and mind
2. To overcome stress

Course Outcomes: Students will be able to:
1. Develop healthy mind in a healthy body thus improving social health also
2. Improve efficiency

Sr. No.	Topics	Hrs.
1	Definitions of Eight parts of yog. (Ashtanga)	8
2	Yam and Niyam. Do`s and Don't's in life. i) Ahinsa, satya, astheya, bramhacharya and aparigraha ii) Shaucha, santosh, tapa, swadhyay, ishwarpranidhan	8
3	Asan and Pranayam i) Various yog poses and their benefits for mind & body ii)Regularization of breathing techniques and its effects-Types of pranayam	8

Reference Books:
1. Yogic Asanas for Group Tarining-Part-I" : Janardan Swami Yogabhyasi Mandal, Nagpur
2. "Rajayoga or conquering the Internal Nature" by Swami Vivekananda, Advaita Ashrama (Publication Department), Kolkata

M.E. Semester –II
Choice Based Credit Grading Scheme (CBCGS 2019)
Proposed Syllabus under Autonomy Scheme

ME (Information Technology)							SEM: II		
Course Name: Personality development through life enlightenment skills							**Course Code:** 2AAE8		
Teaching Scheme (Program Specific)						**Examination Scheme (Formative/ Summative)**			
Modes of Teaching / Learning / Weightage						**Modes of Continuous Assessment / Evaluation**			
Hours Per Week						**Theory (100)**		**Practical/Oral (25)**	**Term Work (50)**	**Total**
Theory	**Tutorial**	**Practical**	**Contact Hours**	**Credits**	**IA**	**ESE**	**PR/OR**	**TW**	
2	-	-	2	-	-	-	-	50	**50**
IA: In Semester Assessment									
ESE: End Semester Examination									
The weightage of marks for continuous evaluation of Term work/Report: Formative (40%), Timely completion of Assignment (40%) and Attendance (20%)									

Course objectives:
1. To learn to achieve the highest goal happily
2. To become a person with stable mind, pleasing personality and determination
3. To awaken wisdom in students

Course Outcomes:
1. Study of Shrimad-Bhagwad-Geeta will help the student in developing his personality and achieve the highest goal in life
2. The person who has studied Geeta will lead the nation and mankind to peace and prosperity
3. Study of Neetishatakam will help in developing versatile personality of students.

Module No.	Topics	Hrs.
1	Neetisatakam-Holistic development of personality Verses- 19,20,21,22 (wisdom) Verses- 29,31,32 (pride & heroism) Verses- 26,28,63,65 (virtue) Verses- 52,53,59 (dont's) Verses- 71,73,75,78 (do's)	8
2	Approach to day to day work and duties. Shrimad Bhagwad Geeta : Chapter 2-Verses 41, 47,48, Chapter 3-Verses 13, 21, 27, 35, Chapter 6-Verses 5,13,17, 23, 35, Chapter 18-Verses 45, 46, 48.	8

3	Statements of basic knowledge.	8
	Shrimad Bhagwad Geeta: Chapter2-Verses 56, 62, 68	
	Chapter 12 -Verses 13, 14, 15, 16,17, 18	
	Personality of Role model. Shrimad Bhagwad Geeta:	
	Chapter2-Verses 17, Chapter 3-Verses 36,37,42,	
	Chapter 4-Verses 18, 38,39	
	Chapter18 – Verses 37,38,63	

Reference Books:

1. "Srimad Bhagavad Gita" by Swami Swarupananda Advaita Ashram (Publication
2. Department), Kolkata
3. Bhartrihari's Three Satakam (Niti-sringar-vairagya) by P.Gopinath,
4. Rashtriya Sanskrit Sansthanam, New Delhi.

M.E. Semester –II
Choice Based Credit Grading Scheme (CBCGS 2019)
Proposed Syllabus under Autonomy Scheme

ME (Information Technology)							SEM: II			
Course Name: Laboratory III							**Course Code:** 2IT07			
Contact Hours Per Week: 04							**Credits:** 02			
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**	**50**
-	-	4	4	2		-	-	25	25	
IA: In-Semester Assessment **ESE :** End Semester Examination										
The weightage of marks for continuous evaluation of Term work/Report: Formative (40%), Timely completion of Practical (40%) and Attendance (20%)										

Each Laboratory assignment will be done by an individual student. The Faculty teaching programme core subjects will be required to propose the respective Laboratory assignments. These will be essentially hands-on practical /Case Study.

M.E. Semester –II
Choice Based Credit Grading Scheme (CBCGS 2019)
Proposed Syllabus under Autonomy Scheme

ME (Information Technology)							SEM: II		
Course Name: Mini Project With Seminar							**Course Code:** 2IT09		
Contact Hours Per Week: 04							**Credits:** 02		
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**	
-	-	4	4	2	-	-	50		**50**
IA: In-Semester Assessment **ESE :** End Semester Examination									
The weightage of marks for continuous evaluation of Term work/Report: Formative (40%), Timely completion of Practical (40%) and Attendance (20%)									

Each student should individually carry out a minor project under the guidance of a teacher. The minor project should preferably have components from the courses learnt in semester I and II. After completion of the Minor project the student should demonstrate the working of the same to a panel of examiners followed by a presentation explaining the utility of the work and contributions to theory/ practice /society.

M.E. Semester –II
Choice Based Credit Grading Scheme (CBCGS 2019)
Proposed Syllabus under Autonomy Scheme

ME (Information Technology)						SEM: II				
Course Name: Laboratory IV						**Course Code:** 2IT08				
Contact Hours Per Week: 04						**Credits:** 02				
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**	
-	-	4	4	2		-	-	25	25	**50**
IA: In-Semester Assessment **ESE :** End Semester Examination										
The weightage of marks for continuous evaluation of Term work/Report: Formative (40%), Timely completion of Practical (40%) and Attendance (20%)										

Each Laboratory assignment will be done by an individual student. The Faculty teaching programme elective subject will be required to propose the respective Laboratory assignments. These will be essentially hands-on practical /Case Study.