M.E. Semester –I
Choice Based Credit Grading Scheme (CBCGS 2019)

<table>
<tr><td colspan="5">ME (Information Technology)</td><td colspan="4">SEM : I</td></tr>
<tr><td colspan="5">Course Name : Mathematical Foundation of Computer Science & Information Technology</td><td colspan="4">Course Code : PEC-ITME101</td></tr>
<tr><td colspan="5">Contact Hours Per Week : 03</td><td colspan="4">Credits : 03</td></tr>
<tr><td colspan="5">Teaching Scheme (Program Specific)</td><td colspan="4">Examination Scheme (Formative/ Summative)</td></tr>
<tr><td colspan="5">Modes of Teaching / Learning / Weightage</td><td colspan="4">Modes of Continuous Assessment / Evaluation</td></tr>
<tr><td colspan="5">Hours Per Week</td><td colspan="2">Theory (100)</td><td>Practical/ Oral (25)</td><td>Term Work (25)</td><td>Total</td></tr>
<tr><td>Theory</td><td>Tutorial</td><td>Practical</td><td>Contact Hours</td><td>Credits</td><td>IA</td><td>ESE</td><td>PR</td><td>TW</td><td rowspan="2">100</td></tr>
<tr><td>3</td><td>-</td><td>-</td><td>3</td><td>3</td><td>25</td><td>75</td><td>-</td><td>-</td></tr>
<tr><td colspan="9">IA: In-Semester Assessment - Paper Duration – 1.5 Hours
ESE : End Semester Examination - Paper Duration - 3 Hours</td></tr>
<tr><td colspan="9">Prerequisite: Discrete Mathematics</td></tr>
</table>

Course Objectives:

1. To understand the mathematical fundamentals that is prerequisites for a variety of courses like Data mining, Network protocols, analysis of Web traffic, Computer security, Software engineering, Computer architecture, operating systems, distributed systems, Bioinformatics, Machine learning.
2. To develop the understanding of the mathematical and logical basis to many modern techniques in information technology like machine learning, programming language design, and concurrency.
3. To study various sampling and classification problems

Course Outcomes:

Sr. No.	Course Outcomes	Cognitive levels of attainment as per Bloom's Taxonomy
1	To understand the basic notions of discrete and continuous probability.	Understand(U), Apply(A), Evaluate(E)
2	To understand the methods of statistical inference, and the role that sampling distributions play in those methods.	Understand(U), Apply (A), Create(C)
3	To be able to perform correct and meaningful statistical analyses of simple to moderate complexity.	Understand(U), Apply (A), Create(C)

Detailed syllabus:

Module No.	Detailed Content	Hours	Cognitive levels of attainment as per Bloom's Taxonomy
1	Probability mass, density, and cumulative distribution functions, Parametric families of distributions, Expected value, variance, conditional expectation, Applications of the univariate and multivariate Central Limit Theorem, Probabilistic inequalities, Markov chains	**07**	Apply(A)
2	Random samples, sampling distributions of estimators**,** Methods of Moments and Maximum Likelihood**,**	**07**	Apply(A)
3	Statistical inference**,** Introduction to multivariate statistical models: regression and classification problems, principal components analysis**,** The problem of over fitting model assessment.	**08**	Analyze (AN)
4	Graph Theory: Isomorphism, Planar graphs, graph coloring, Hamilton circuits and Euler cycles. Permutations and Combinations with and without repetition. Specialized techniques to solve combinatorial enumeration problems	**11**	Evaluate (E)
5	**Computer science and engineering applications** Data mining, Network protocols, analysis of Web traffic, Computer security, Software engineering, Computer architecture, operating systems, distributed systems, Bioinformatics, Machine learning.	**10**	Apply (A)
6	Recent Trends in various distribution functions in mathematical field of computer Science for varying fields like bioinformatics, soft computing, and computer vision.	**05**	Apply (A)

References:

1. John Vince, Foundation Mathematics for Computer Science, Springer.
2. K. Trivedi. Probability and Statistics with Reliability, Queuing, and Computer Science Applications. Wiley.
3. M. Mitzenmacher and E. Upfal. Probability and Computing: Randomized Algorithms and Probabilistic Analysis.
4. Alan Tucker, Applied Combinatory, Wiley

M.E. Semester –I
Choice Based Credit Grading Scheme (CBCGS 2019)

ME (Information Technology)							**SEM :** I		
Course Name :IT Infrastructure Design							**Course Code :** PEC-ITME102		
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**									
Prerequisite: Basic knowledge of networking techniques., Basic of Networking Topology, OSI Layer Basics, Basics of Internetworking Devices									

Course Objectives:

1. Provide knowledge of Enterprise wide Network Design.
2. Provide Knowledge of Data center design includes Storage network
3. Give insight into the implementation of SDN and how it will impact current Design practice
4. Understand latest trend in SDN

Course Outcomes: Students should be able to

Sr. No.	**Course Outcomes**	**Cognitive levels of attainment as per Bloom's Taxonomy**
1	Design Enterprise wide network design considering various QoS Parameter	Understand(U), Apply(A), Evaluate(E)
2	Explain the design challenge of large scale data center	Understand(U), Apply (A), Create(C)
3	Implementation of SDN and how it will impact current Design practice	Understand(U), Apply (A), Create(C)

Detailed syllabus:

Module	**Detailed Content**	**Hours**	**Cognitive levels of attainment as per Bloom's Taxonomy**

Unit 1	Enterprise Network Design: Understanding Network Requirement analysis, Architecture and Design Process Network Architecture: Component Architecture –Routing, Network Management, Performance, And Security. Architectural models: topological, flow model, Functional model Addressing and Routing Architecture, Network Management Architecture, Performance Architecture Border less Network Architecture. Network Design: Designing the network topology and solutions-Top Down Approach Network Structure Model: Hierarchical Network Model, Enterprise wide network Architecture model- Enterprise Edge Area. E-commerce, Internet Connectivity to remote, enterprise branch and enterprise Data center module. High Availability Network Services- Workstation to Router redundancy and LAN High Availability protocols, Route, Server Redundancy, Load Balancing., link Media Redundancy.	**08**	Understand(U), Apply (A), Evaluate(E)
Unit 2	Enterprise LAN Design: Ethernet Design Rule. 100 Mbps Fast Ethernet Design rules, gigabit Ethernet Design Rules, 10 Gigabit Ethernet Design rules, 10GE Media types Understanding Working of Repeater, hub, Bridge, routers, Layer2/3 Switch Campus LAN Design Best Practice Server Farm Design, DMZ design. Campus LAN QoS consideration Multicast Traffic Consideration	**06**	Understand(U), Apply (A)
Unit 3	Data Center Design: Architecture Consideration: Infrastructure Model, Service Layers Model of Cloud computing. Cloud Reference Architecture Framework, Cloud Data Center Building Blocks. Cloud Data Center Technology Architecture Trust in Cloud Data Center The elements of cloud visibility The elements of cloud protection Cloud Control, Compliance and SLA. Telecommunications Infrastructure Standard for Data Centers ANSI/TIA-942 Telecommunications Infrastructure Standard for Data Centers , NSI/NECA/BICSI-002 Data Center Design and Implementation Best Practices Purpose of TIA-942 Design Elements - Cabling Design, Facility Design, Network Design. Relationship of Spaces, Data Center Topology Data Center Tiers Basic Data Center Design Example.	**10**	Understand(U), Apply(A), Evaluate(E)
Unit 4	Enterprise Wireless LAN Architecture: Components of Centralize Architecture: understanding 802.11X standards, LWAPP WLAN Controller. WLAN technologies (Narrow Band, Spread Spectrum, FHSS, DSS) and topologies, Wireless Network Components: Access Point and NICs, Router etc; WLAN enterprise design, WLAN performance, WLAN monitoring and troubleshooting, WLAN security. Intra and inter controller roaming.	**05**	Understand(U), Apply (A)
Unit 5	SAN: Need for storage Network, Data Protection and RAID, Storage Network Architecture and IP storage, Storage Network Backup and Recovery, Storage and Network in Storage Network, Software for Storage Network, Adopting and Managing SAN.	**07**	Apply (A), Create(C)

Unit 6	Software Defined Network : Understanding SDN and Open Flow : SDN – Network Virtualization Techniques, SDN Building Blocks, OpenFlow messages – Controller to Switch, Symmetric and Asynchronous messages, Implementing OpenFlow Switch, OpenFlow controllers , PoX and NoX, NetApp Development on top of SDN, Open Flow in Cloud Computing. Case study: how SDN changed Traditional Enterprise network Design	**09**	Apply (A), Create(C)

References:

1. Network Analysis, Architecture, and Design 3rd Edition, Morgan Kaufman, James D. CCDA Cisco official Guide
3. Cisco Cloud Computing - Data Center Strategy, Architecture, and Solutions by KapilBakshi Cisco Systems White paper
4. https://en.wikipedia.org/wiki/TIA-942
5. "Data Center Top-of-Rack Architecture Design". White paper. Cisco Systems. April 18, 2011. Retrieved July 10, 2013.
6. Software Defined Networking with Open Flow: PACKT Publishing Siamak Azodolmolky
7. Storage Network Management and Retrieval by Dr. Vaishali Khairnar, Nilima Dongre, Wiley India
8. Storage Networks explained by Ulf Troppen, wiley publication
9. Storage Area Network Essentials: A Complete Guide to Understanding and Implementing SANs by Richard Barker, Paul Massiglia, Wiley India

M.E. Semester –I
Choice Based Credit Grading Scheme (CBCGS 2019)

ME (Information Technology)							**SEM :** I		
Course Name : Data Warehousing and Data Mining							**Course Code :** PEC-ITME10111		
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**									
Prerequisite: Databases, Probability									

Course Objectives:

- The objective of this course is to introduce data warehousing and mining techniques. 1Applicationofdataminginwebmining,patternmatchingandclusteranalysisisincluded to aware students of broad data mining areas.

Course Outcomes: After completion of course, students would be:

Sr. No.	Course Outcomes	Cognitive levels of attainment as per Bloom's Taxonomy
1	Study of different sequential pattern algorithms	Understand(U), Apply(A), Evaluate(E)
2	Study the technique to extract patterns from time series data and it application in real world.	Understand(U), Apply (A), Create(C)
3	Can extend the Graph mining algorithms to Web mining	Understand(U), Apply (A), Create(C)

Detailed Content

Module	Detailed Content	Hrs.	Cognitive levels of attainment as per Bloom's Taxonomy
1	Introduction to Data Warehousing; Data Mining: Mining frequent patterns, association and correlations; Sequential Pattern Mining concepts, primitives, scalable methods;	7	Remember (R)
2	Classificationandprediction;ClusterAnalysis–TypesofDatainClusterAnalysis, Partitioningmethods,HierarchicalMethods;TransactionalPatternsandother temporal based frequent patterns,	8	Analyze (AN)
3	Mining Time series Data, Periodicity Analysis for time related sequence data, Trend analysis, Similarity search in Time-series analysis;	8	Analyze (AN)
4	MiningDataStreams,Methodologiesforstreamdataprocessingandstreamdata systems, Frequent pattern mining in stream data, Sequential Pattern Mining in Data Streams, Classification of dynamic data streams, Class Imbalance Problem; Graph Mining; Social Network Analysis;	11	Apply (A), Analyze (AN)
5	Web Mining, Mining the web page layout structure, mining web link structure, mining multimedia data on the web, Automatic classification of web documents and web usage mining; Distributed Data Mining.	9	Apply (A), Analyze (AN)
6	Recent trends in Distributed Warehousing and Data Mining, Class Imbalance Problem; Graph Mining; Social Network Analysis	5	Apply (A), Analyze (AN)

References:

1. Jiawei Han and M Kamber, Data Mining Concepts and Techniques, Second Edition, Elsevier Publication, 2011.
2. Vipin Kumar, Introduction to Data Mining-Pang-Ning Tan, Michael Steinbach, Addison Wesley, 2006.
3. GDongandJPei, Sequence DataMining, Springer,2007

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M.E. Semester –I
Choice Based Credit Grading Scheme (CBCGS 2019)

ME (Information Technology)							**SEM :** I		
Course Name : Big Data Analytics							**Course Code :** PEC-ITME10112, PEC-ITME10131		
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**									
Prerequisite: Data Structure, Computer Architecture and Organization									

COURSE OBJECTIVE
• Understandbigdataforbusinessintelligence.Learnbusinesscasestudiesforbigdataanalytics. Understand no sql big data management. Perform map-reduce analytics using Hadoop and related Tools

Course Outcomes: After completion of course, students would be:

Sr. No.	**Course Outcomes**	**Cognitive levels of attainment as per Bloom's Taxonomy**
1	Describe big data and use cases from selected business domains	Understand(U), Apply (A), Create(C)
2	Explain NoSQL big data management	Understand(U), Apply (A), Create(C)
3	Install, configure, and run Hadoop and HDFS	Understand(U), Apply (A), Create(C)
4	Perform map-reduce analytics using Hadoop	Understand(U), Apply (A), Create(C)
5	Use Hadoop related tools such as HBase, Cassandra, Pig, and Hive for big data analytics	Understand(U), Apply (A), Create(C)

Detailed Content:

Module No.	Topics	Hrs.	Cognitive levels of attainment as per Bloom's Taxonomy
1	What is big data, why big data, convergence of key trends, unstructured data, industry examples of big data, web analytics, big data and marketing, fraud and big data, risk and big data, credit risk management, big data and algorithmic trading, big data and healthcare, big data in medicine, advertising and big data, big data technologies, introduction to Hadoop, open source technologies, cloud and big data, mobile business intelligence, Crowd sourcing analytics, inter and trans firewall analytics.	8	Apply(A)
2	Introduction to NoSQL, aggregate data models, aggregates, key-value and document data models, relationships, graph databases, schemaless databases, materialized views, distribution models, sharding, master-slave replication, peerpeer replication, sharding and replication, consistency, relaxing consistency, version stamps, map-reduce, partitioning and combining, composing map-reduce calculations.	8	Apply(A)
3	Data format, analyzing data with Hadoop, scaling out, Hadoop streaming, Hadoop pipes, design of Hadoop distributed file system (HDFS), HDFS concepts, Java interface, data flow, Hadoop I/O, data integrity, compression, serialization, Avro, file-based data structures	9	Analyze (AN)
4	MapReduce workflows, unit tests with MRUnit, test data and local tests, anatomy of MapReduce job run, classic Map-reduce, YARN, failures in classic Map-reduce and YARN, job scheduling, shuffle and sort, task execution, MapReduce types, input formats, output formats	10	Analyze (AN)
5	Hbase, data model and implementations, Hbase clients, Hbase examples, praxis. Cassandra, Cassandra data model, Cassandra examples, Cassandra clients, Hadoop integration	7	Create(C)
6	Pig, Grunt, pig data model, Pig Latin, developing and testing Pig Latin scripts. Hive, data types and file formats, HiveQL data definition, HiveQL data manipulation, HiveQL queries	6	Create(C)

References:

1. Michael Minelli, Michelle Chambers, and Ambiga Dhiraj," Big Data, Big Analytics: Emerging
2. Business Intelligence and Analytic Trends for Today's Businesses",Wiley, 2013.
3. P.J.Sadalage and M.Fowler,"NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence", Addison-Wesley Professional, 2012.
4. TomWhite,"Hadoop:The Definitive Guide",ThirdEdition,O'Reilley,2012.
5. Eric Sammer, "Hadoop Operations",O'Reilley, 2012.
6. E.Capriolo, D.Wampler, and J.Rutherglen,"ProgrammingHive",O'Reilley,2012.
7. LarsGeorge,"HBase: The Definitive Guide",O'Reilley,2011.
8. Eben Hewitt, "Cassandra: The Definitive Guide", O'Reilley, 2010.
9. Alan Gates, "Programming Pig", O'Reilley, 2011.

M.E. Semester –I
Choice Based Credit Grading Scheme (CBCGS 2019)

<table>
<tr><td colspan="7">ME (Information Technology)</td><td colspan="4">SEM : I</td></tr>
<tr><td colspan="7">Course Name :Advanced in Software Engineering</td><td colspan="4">Course Code : PEC-ITME10113</td></tr>
<tr><td colspan="7">Contact Hours Per Week : 03</td><td colspan="4">Credits : 03</td></tr>
<tr><td colspan="7">Teaching Scheme (Program Specific)</td><td colspan="4">Examination Scheme (Formative/ Summative)</td></tr>
<tr><td colspan="7">Modes of Teaching / Learning / Weightage</td><td colspan="4">Modes of Continuous Assessment / Evaluation</td></tr>
<tr><td colspan="5">Hours Per Week</td><td colspan="2">Theory (100)</td><td>Practical/Oral (25)</td><td>Term Work (25)</td><td>Total</td></tr>
<tr><td>Theory</td><td>Tutorial</td><td>Practical</td><td>Contact Hours</td><td>Credits</td><td>IA</td><td>ESE</td><td>PR</td><td>TW</td><td rowspan="2">100</td></tr>
<tr><td>3</td><td>-</td><td>-</td><td>3</td><td>3</td><td>25</td><td>75</td><td>-</td><td>-</td></tr>
<tr><td colspan="10">IA: In-Semester Assessment - Paper Duration – 1.5 Hours
ESE : End Semester Examination - Paper Duration - 3 Hours</td></tr>
<tr><td colspan="10">Prerequisite: Nature of Software, Software Definition, Software characteristics, Software Application Domains, Software Myths, Software Engineering Practice</td></tr>
</table>

Course Objectives: Objectives of this course include:

1. To learn and understand the principles of Software Engineering
2. To Learn and understand Software Development Life Cycle
3. ToapplyProjectManagementandRequirementanalysisprinciplestoS/Wprojectdevelopment.
4. To apply Design and Testing principles to S/W project development.

Course Outcomes: After completion of course, students would be:

Sr. No.	Course Outcomes	Cognitive levels of attainment as per Bloom's Taxonomy
1	Compare and chose a process model for a software project development.	Analyze (AN)
2	Analyze and model software requirements of a software system	Analyze (AN)
3	Design and Modeling of a software system with tools	Create (C)
4	Prepare the SRS, Design document, Project plan of a given software system	Create (C)

DETAILED SYLLABUS:

Sr. No.	Module	Detailed Content	Hrs	Cognitive levels of attainment as per Bloom's Taxonomy
1	Nature of Software	Software Engineering, The Software Process, A Generic Process Model, Prescriptive Process Models: The Waterfall Model, Incremental Process Models, Evolutionary Process Models, Concurrent Models, Specialized Process Models, The Formal Methods Model, The Unified Process Personal, Agility Principles , Extreme Programming (XP), Scrum, Introduction to Clean Room Software Engineering	**06**	**L1,L2.L 3,L4,**
2	Requirements Engineering	Requirements Engineering, Eliciting Requirements, Collaborative Requirements Gathering, Quality Function Deployment, Usage Scenarios, Elicitation Work Products, Developing Use Cases, Building the Requirements Model, Negotiating Requirements, Validating Requirements, Analysis: Scenario-Based Modeling, UML Models, Developing an Activity Diagram, Swim-lane Diagrams, Class-Based Modeling, Requirements Modeling Strategies: Flow Oriented Modeling, Creating a Behavioral Patterns for Requirements Modeling, State Machine Diagram with orthogonal states, Requirements Modeling for Web Apps, SRS	**08**	**L1,L2.L 3,L4**
3	Design Methods and Models	The Design Process, Concepts of design, Design Quality, Design Principles, Object-Oriented Design Concepts, Design Classes, The Design Model and elements, Software Architecture, Importance, Architectural Styles, Architectural Design, Assessing Alternative Architectural Designs, using Architectural Styles in Designs, Component Design, Class- Based Components, Conducting Component Level Design, Component-Level Design for WebApps, User Interface Design, The Golden Rules, User Interface Analysis and Design, Interface Analysis Interface Design Steps, WebApp Interface Design, Design Evaluation, Design Document, Modifiability: SAAM Method, ATAM Method, The HASARD Method.	**08**	**L1,L2.L 3,L4,L5**

4	Testing Principles	Principles A Strategic Approach to Software Testing, Strategic Issues, Test Conventional Software, Test Strategies for Object-Oriented Software, Test Strategies for WebApps, Validation Testing, System Testing, The Art of Debugging, Software Testing Fundamentals, White-Box Testing , Basis Path Testing, Control Structure Testing, Black-Box Testing, Model-Based Testing, Testing for Specialized Environments, Architectures, Object-Oriented Testing Strategies, Object- Oriented Testing Methods, Test Cases and the Class Hierarchy, Testing Concepts for Web Apps, Testing Process—An Overview, User Interface Testing , Test plan, Positive Testing Negative Testing	**06**	**L1,L2.L 3,L4,L5**
5	Project Planning and management	The Management Spectrum, Software Scope, Problem Decomposition, Process Decomposition, Process and project metrics, Size-Oriented Metrics, Function Oriented Metrics, Reconciling LOC and FP Metrics, Object-Oriented Metrics, Integrating Metrics within the Software Process, Software Project Estimation, Decomposition, Process-Based Estimation, Estimation with Use Cases, Empirical Estimation Models, The Structure of Estimation Models, The COCOMO II Model , Project scheduling: Basic Concepts, Defining a Task Set for the Software Project , Scheduling : Tracking the Schedule, Earned Value Analysis Risk management: Reactive versus Proactive Risk Strategies, Risk Identification, Assessing Overall Project Risk, Risk Projection, Developing a Risk Table, Assessing Risk, Project Plan	**11**	**L1,L2.L 3,L4,L5**
6	Advanced Trends in Software Engineering	Introduction to Formal Specification Languages: Object Constraint Language (OCL), Z Specification Language, Software reuse, Distributed software engineering, Service- oriented architecture, Embedded software, Aspect-oriented software engineering, Introduction to DevOps, Docker, Github.	**06**	**L1,L2.L 3,L4,L5, L6**

Text Books:

1. Roger S Pressman "Software Engineering: APractitioner's Approach "7th Edition Mcgraw-Hill ISBN:0073375977
2. Ian Sommerville "Software Engineering"9th edition Pearson Education SBN-13:978-0-13- 703515-1, ISBN-10:0-13-703515-2
3. Hong Zhu "Software Design Methodology", Elsevier ISBN:978-81-312-0356-9References:
4. Pankaj Jalote " An Integrated Approach to Software Engineering" 3rd Edition Narosa Publication ISBN:81-7319-702-4
5. Rajib Mall " Fundamentals of Software Engineering" 3rd edition PHI.

6. Pfleejer " Software Engineering- Theory and Practice" 4th edition
7. Martin Fowler "Distilled UML" 3rd edition Stephen H.Kan, "Metrics and Model sin Software Quality Engineering", 2nd Edition, Pearson, 2003
8. 5.HansVanVilet"Software Engineering Principles and Practice" 3rd edition Wiley Devops.com

M.E. Semester –I
Choice Based Credit Grading Scheme (CBCGS 2019)

ME (Information Technology)							**SEM :** I		
Course Name: Data Encryption & Compression							**Course Code :** PEC-ITME10121, PEC-ITME10141		
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**									
Prerequisite: Computer Basics, Procedural Programming Languages									

COURSE OBJECTIVE
• This course will cover the concept of security, types of attack experienced, encryption and authentication for deal with attacks, what is data compression, need and techniques of data compression

Course Outcomes: After completion of course, students would be:

Sr. No.	**Course Outcomes**	**Cognitive levels of attainment as per Bloom's Taxonomy**
1	The knowledge of plaintext, cipher text, RSA and other cryptographic algorithm.	Understand(U) Apply(A)
2	Key Distribution, Communication Model, Various models for data compression	Understand(U) Apply(A) Analyze(AN)

LECTURE WITH BREAKUP	Hrs.	Cognitive levels of attainment as per Bloom's Taxonomy
Unit 1: **Introduction to Security:** Need for security, Security approaches, Principles of security, Types of attacks. **Encryption Techniques:** Plaintext, Cipher text, Substitution & Transposition techniques, Encryption & Decryption, Types of attacks, Key range & Size.	8	Understand(U)
Unit 2: **Symmetric & Asymmetric Key Cryptography:** Algorithm types & Modes, DES, IDEA, Differential & Linear Cryptanalysis, RSA, Symmetric & Asymmetric key together, Digital signature, Knapsack algorithm. **User Authentication Mechanism:** Authentication basics, Passwords, Authentication tokens, Certificate based & Biometric authentication, Firewall.	10	Understand(U) Apply(A)
Unit 3: **Case Studies Of Cryptography:** Denial of service attacks, IP spoofing attacks, Secure inter branch payment transactions, Conventional Encryption and Message Confidentiality, Conventional Encryption Principles, Conventional Encryption Algorithms, Location of Encryption Devices, Key Distribution. **Public Key Cryptography and Message Authentication:** Approaches to Message Authentication, SHA-1, MD5, Public-Key Cryptography Principles, RSA, Digital, Signatures, Key Management.	9	Understand(U) Apply(A) Analyze(AN)
Unit 4: **Introduction:** Need for data compression, Fundamental concept of data compression & coding, Communication model, Compression ratio, Requirements of data compression, Classification. **Methods of Data Compression:** Data compression-- Loss less & Lossy	7	Understand(U) Apply(A)
Unit 5: Entropy encoding-- Repetitive character encoding, Run length encoding, Zero/Blank encoding; Statistical encoding-- Huffman, Arithmetic & Lempel-Ziv coding; Source encoding-- Vector quantization (Simple vector quantization & with error term); Differential encoding—Predictive coding, Differential pulse code modulation, Delta modulation, Adaptive differential pulse code modulation; Transform based coding : Discrete cosine transform & JPEG standards; Fractal compression	10	Understand(U) Apply(A)
Unit 6: Recent trends in encryption and data compression techniques.	4	Understand(U) Apply(A) Analyze(AN)

References:

1. Cryptography and Network Security by B.Forouzan, McGraw-Hill.
2. The Data Compression Book by Nelson, BPB.
3. Cryptography & Network Security by Atul Kahate, TMH.

M.E. Semester –I
Choice Based Credit Grading Scheme (CBCGS 2019)

ME (Information Technology)							**SEM :** I		
Course Name : Data Security and Access Control							**Course Code :** PEC-ITME10122, PEC-ITME10142		
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**									
Prerequisite: Computer Basics, Procedural Programming Languages									

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 accesscontrol techniques.

Course Outcomes: After completion of course, students would be:

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 and algorithms	Understand(U) Apply(A)
2	They will learn how to analyze the data, identify the problems, and choose the relevant models and algorithms to apply.	Understand(U) Apply(A) Analyze(AN)
3	They will further be able to assess the strengths and weaknesses of various access control models and to analyze their behavior.	Understand(U) Apply(A) Analyze(AN) Evaluate(E)

Detailed Contents:

LECTURE WITH BREAKUP	Hrs.	Cognitive levels of attainment as per Bloom's Taxonomy
Unit1: 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.	9	Understand(U)
Unit 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.	8	Understand(U) Apply(A) Analyze(AN)
Unit 3: Biba'sindignity 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. IntegratingRBACwithenterpriseITinfrastructures:RBACforWFMSs,RBACfor UNIX and JAVA environments Case study: Multiline Insurance Company	10	Understand(U) Apply(A) Analyze(AN)
Unit 4: Smart Card based Information Security, Smart card operating system-fundamentals, design and implantation principles, memory organization, smart card 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.	10	Understand(U) Apply(A)
Unit 5: Recent trends in Database security and access control mechanisms. Case study of Role-Based Access Control (RBAC) systems.	7	Understand(U) Apply(A) Analyze(AN)
Unit 6: Recent Trends related to data security management, vulnerabilities in different DBMS.	4	Understand(U)

References:

1. Role Based Access Control: David F.Ferraiolo, D.Richard Kuhn, Ramaswamy Chandramouli.
2. http://www.smartcard.co.uk/tutorials/sct-itsc.pdf : Smart Card Tutorial.

M.E. Semester –I
Choice Based Credit Grading Scheme (CBCGS 2019)

IT (Information Technology)							**SEM :** I		
Course Name : Information Theory & Coding							**Course Code :** PEC-ITME10123, PEC-ITME10143		
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**									
Prerequisite: Discrete Mathematics									

Course Objectives: Students will be try to learn

1. The concepts of classical encryption techniques and concepts Information and Entropy Information Measures.
2. Different Error detecting and error correcting codes used in information theory.
3. Know the working of different image and video compression techniques.
4. The working principles and utilities of various cryptographic algorithms including secret key cryptography, hashes and message digests, and public key algorithms.

Course Outcomes: After completion of course, students would be:

Sr. No.	Course Outcomes	Cognitive levels of attainment as per Bloom's Taxonomy
1	Explain concepts of classical encryption techniques and concepts Information and Entropy Information Measures.	Remember (R), Understand(U)
2	Implement Different Error detecting and error correcting codes used in information theory.	Remember (R), Understand(U), Apply(A), Analyze(A)
3	Explain the working of different image and video compression techniques.	Understand(U), Apply(A), Analyze(A)
4	Describe the working principles and utilities of various cryptographic algorithms including secret key cryptography, hashes and message digests, and public key algorithms	Understand(U),Apply(A), Analyze(A)

Detailed syllabus:

Module No.	Detailed Content	Hours	Cognitive levels of attainment as per Bloom's Taxonomy
1	**Uncertainty, Information and Entropy Information Measures**: Characteristics on information measure; Shannon's concept of information; Shannon's measure of information; Model for source coding theorem; Communication system; Source coding and line/channel coding; channel mutual information capacity (Bandwidth);	07	Remember (R), Understand(U), Apply(A)
2	**Error detecting and error correcting codes;** Types of codes; Block codes; Tree codes; Hamming codes; Description of linear block codes by matrices; Description of linear tree code by matrices; Parity check codes; Parity check polynomials;	07	Remember (R), Understand(U), Apply(A), Analyze(AN)
3	**Compression:** Lossless and lossy; Huffman codes; Binary Image compression schemes; Run –length Encoding; CCITT group-3 1D compression; CCITT group-3 2D compression; CCITT group-4 2D compression;	08	Remember (R), Understand(U), Apply(A),
4	**Video Image Compression:** Requirement of full motion video compression; CCITT H 261 video coding algorithm; MPEG compression methodology; MPEG-2 compression; Audio (Speech) compression;	11	Remember (R), Understand(U), Apply(A), Analyze(AN)
5	**Cryptography:** Encryption; Decryption; Cryptogram (cipher text); Concept of cipher; Cryptanalysis; Keys: Single key (Secret key); Cryptography; two-key (Public key) cryptography; Single key cryptography; Ciphers; Block Cipher code; Stream ciphers;	10	Remember (R), Understand(U), Apply(A)
6	**Requirements for secrecy**: The data Encryption Standard; Public Key Cryptography; Diffie-Hellmann public key distribution; The Rivest- Shamin Adelman(R-S-A) system for public key cryptography; Digital Signature;	05	Remember (R), Understand(U), Apply(A), Analyze(AN), Evaluate (E)

References:

1. Digital Communication by Das, Mullick& Chatterjee, New Age Pub.
2. Digital Communication by Proakis, TMH
3. Digital Image Processing by Gonzales & Woods, Pearson
4. Local Area Network by G. Keiser, TMH

M.E. Semester –I
Choice Based Credit Grading Scheme (CBCGS 2019)

ME (Information Technology)							**SEM :** I		
Course Name : Wireless Access Technology							**Course Code :** PEC-ITME10132		
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**									

Course objectives:
1. Overview of wireless access technologies, fixed wireless access networks. Terminal mobility issues regarding wireless access to Internet.
2. Introduction to various Network topologies, hotspot networks, Communication links: point-to-point, point-to-multipoint, multipoint-to-multipoint.
3. To provide an overview of Standards for most frequently used wireless access networks: WPAN, UWB, WLAN, WMAN, and WWAN. Network services. Wireless access networks planning, design and installation
4. To get and insight of Wireless networking security issues, Wireless access network exploitation and management, software requirements, link quality control.

Course outcomes: Students should be able to:

Sr. No.	**Course Outcomes**	**Cognitive levels of attainment as per Bloom's Taxonomy**
1	Interpret basic terms and characteristics of wireless access networks	Apply(A)
2	Compare various wireless access technologies	Analyze (AN)
3	Analyze measurements of wireless access network parameter	Analyze (AN)
4	Assess security issues in wireless networks	Analyze(AN)
5	Choose modulation technique for wireless transmission	Evaluate (E)

Module No.	Topics	Hrs.	Cognitive levels of attainment as per Bloom's Taxonomy
1	Necessity for wireless terminals connectivity and networking. Wireless networking advantages and disadvantages, Overview of wireless access technologies. Narrowband and broadband networks, fixed and nomadic networks. Wireless local loop (WLL), Public Switched Telephone Network (PSTN) interfaces	8	Apply(A)
2	Fixed wireless access (FWA) networks, frequency bands for different networks. Criterions for frequency bands allocation, Network topologies, hotspot networks. Communication links: point-to-point (PTP), point-to-multipoint (PMP), multipoint-to-multipoint (MTM)	8	Apply(A)
3	Standards for most frequently used wireless access networks: WPAN (802.15, Bluetooth, DECT, IrDA), UWB (Ultra-Wideband), WLAN (802.11, Wi-Fi, HIPERLAN, IrDA), WMAN (802.16, WiMAX, HIPERMAN, HIPERACCESS), WWAN (802.20), Other technologies for broadband wireless access, Local Multipoint Distribution Service (LMDS), Multichannel Multipoint Distribution Service (MMDS). Ad Hoc networks, Network services. Services types based on carrier frequency and bandwidth	10	Apply(A)
4	Wireless access networks planning, design and installation. Services provision, legislative and technical aspects, Technical and economic factors for network planning: expenses, coverage, link capacity, network complexity and carrier-to-interference ratio (C/I). Base station or access point allocation. Base station and access point equipment. Terminal mobility issues regarding wireless access to Internet. Wireless networking security issues.	9	Analyze (AN)
5	Example of laptop or handheld PC wireless connection in real environment. PC wireless interface equipment. Wireless access network exploitation and management, software requirements, link quality control. Business model, wireless network services market, market research and marketing, service providers, wireless data application service providers (WDASP) and their role on public telecommunication services market, billing systems.	8	Analyze (AN)
6	Recent trends in wireless networking and various access mechanism, new standards of wireless communication	5	Apply(A)

Reference Books:

1. M. P. Clark, Wireless Access Networks: Fixed Wireless Access and WLL networks – Design and Operation, John Wiley & Sons, Chichester

2. D. H. Morais, Fixed Broadband Wireless Communications: Principles and Practical Applications, Prentice Hall, Upper Saddle River

3. R. Pandya, Introduction to WLLs: Application and Deployment for Fixed and Broadband Services, IEEE Press, Piscataway

M.E. Semester –I
Choice Based Credit Grading Scheme (CBCGS 2019)

<table>
<tr><td colspan="7">ME (Information Technology)</td><td colspan="4">SEM : I</td></tr>
<tr><td colspan="7">Course Name :Mobile Application and services</td><td colspan="4">Course Code :PEC-ITME10133</td></tr>
<tr><td colspan="7">Contact Hours Per Week : 03</td><td colspan="4">Credits : 03</td></tr>
<tr><td colspan="5">Teaching Scheme (Program Specific)</td><td colspan="6">Examination Scheme (Formative/ Summative)</td></tr>
<tr><td colspan="5">Modes of Teaching / Learning / Weightage</td><td colspan="6">Modes of Continuous Assessment / Evaluation</td></tr>
<tr><td colspan="5" rowspan="2">Hours Per Week:</td><td colspan="2">Theory (100)</td><td>Practical/Oral (25)</td><td>Term Work (25)</td><td>Total</td></tr>
<tr><td>Theory</td><td>Tutorial</td><td>Practical</td><td>Contact Hours</td><td>Credits</td><td>MSE</td><td>SEE</td><td>PR</td><td>TW</td><td rowspan="2">100</td></tr>
<tr><td>3</td><td>-</td><td>-</td><td>3</td><td>3</td><td>25</td><td>75</td><td>-</td><td>-</td></tr>
<tr><td colspan="10">IA: In-Semester Assessment - Paper Duration – 1.5 Hours
ESE : End Semester Examination - Paper Duration - 3 Hours</td></tr>
<tr><td colspan="10">Prerequisite: Mobile Computing, Mobile Communication, Computer Networks</td></tr>
</table>

COURSE OBJECTIVE

1. This course presents the three main mobile platforms and their ecosystems, namely Android, iOS, and Phone Gap/ Web OS.
2. It explores emerging technologies and tools used to design and implement feature-rich mobile applications for smart phones and tablets.
3. It also take into account both the technical constraints relative to storage capacity, processing capacity, display screen, communication interfaces, and the user interface, context and profile.

Course Outcomes: After completion of course, students would be:

Sr. No.	Course Outcomes	Cognitive levels of attainment as per Bloom's Taxonomy
1	Identify the target platform and users and be able to define and sketch a mobile application	Apply (A)
2	understand the fundamentals, frameworks, and development lifecycle of mobile application platforms including iOS, Android, and Phone Gap	Understand (U)
3	Design and develop a mobile application prototype in one of the platform (challenge project)	Create (C)

LECTURE WITH BREAKUP	Hrs.	Cognitive levels of attainment as per Bloom's Taxonomy
Unit 1: Introduction:Introduction to Mobile Computing, Introduction to Android Development Environment, Factors in Developing Mobile Applications, Mobile Software Engineering, Frameworks and Tools, Generic UI Development Android user	8	Remember(R) Understand(U)
Unit 2: More on Uis: VUIs and Mobile Apps, Text-to-Speech Techniques, Designing the Right UI, Multichannel and Multimodal Uis, . Storing and Retrieving Data, Synchronization and Replication of Mobile Data, Getting the Model Right, Android Storing and Retrieving Data, Working with a Content Provider	8	Apply (A) Analyze (AN)
Unit 3: Communications via Network and the Web: State Machine, Correct Communications Model, Android Networking and Web, Telephony Deciding Scope of an App, Wireless Connectivity and Mobile Apps, Android Telephony Notifications and Alarms : Performance, Performance and Memory Management, Android Notifications and Alarms, Graphics, Performance and Multithreading, Graphics and UI Performance, Android Graphics	10	Analyze (AN) Evaluate (E)
Unit 4: Putting It All Together : Packaging and Deploying, Performance Best Practices, Android Field Service App, Location Mobility and Location Based Services Android Multimedia: Mobile Agents and Peer-to-Peer Architecture, Android Multimedia	9	Apply (A) Analyze (AN)
Unit 5: Platforms and Additional Issues : Development Process, Architecture, Design, Technology Selection, Mobile App Development Hurdles, Testing, Security and Hacking , Active Transactions, More on Security, Hacking Android	8	Evaluate (E) Create (C)
Unit 6: Recent trends in Communication protocols for IOT nodes, mobile computing techniques in IOT, agents based communications in IOT	5	Understand(U)

References:

1. Wei-Meng Lee, Beginning Android™ 4 Application Development, 2012 by John Wiley & Sons

M.E. Semester –I
Choice Based Credit Grading Scheme (CBCGS 2019)

<table>
<tr><td colspan="5">ME (Information Technology)</td><td colspan="4">SEM : I</td></tr>
<tr><td colspan="5">Course Name: Machine Learning for IT Applications Development</td><td colspan="4">Course Code :PEC-ITME10211, PEC-ITME10222, PEC-ITME10231, PEC-ITME10243</td></tr>
<tr><td colspan="5">Contact Hours Per Week : 03</td><td colspan="4">Credits : 03</td></tr>
<tr><td colspan="5">Teaching Scheme (Program Specific)</td><td colspan="4">Examination Scheme (Formative/ Summative)</td></tr>
<tr><td colspan="5">Modes of Teaching / Learning / Weightage</td><td colspan="4">Modes of Continuous Assessment / Evaluation</td></tr>
<tr><td colspan="5">Hours Per Week</td><td colspan="2">Theory (100)</td><td>Practical/Oral (25)</td><td>Term Work (25)</td><td>Total</td></tr>
<tr><td>Theory</td><td>Tutorial</td><td>Practical</td><td>Contact Hours</td><td>Credits</td><td>IA</td><td>ESE</td><td>PR</td><td>TW</td><td rowspan="2">100</td></tr>
<tr><td>3</td><td>-</td><td>-</td><td>3</td><td>3</td><td>25</td><td>75</td><td></td><td></td></tr>
<tr><td colspan="10">IA: In-Semester Assessment - Paper Duration – 1.5 Hours
ESE : End Semester Examination - Paper Duration - 3 Hours</td></tr>
<tr><td colspan="10">Prerequisite: Knowledge of programming language, Data structures.</td></tr>
</table>

Course Objectives:
To learn the concept of how to learn patterns and concepts from data without being explicitly programmed in various IOT nodes.

1. To design and analyse various machine learning algorithms and techniques with a modern outlook focusing on recent advances.
2. Explore supervised and unsupervised learning paradigms of machine learning.
3. To explore Deep learning technique and various feature extraction strategies.

Course Outcomes: Students should be able to

S.No.	Course Outcomes	Cognitive levels of attainment as per Bloom's Taxonomy
1	Understand the concepts of machine learning algorithms	Analyze (AN)
2	To compare and contrast pros and cons of various machine learning techniques and to get an insight of when to apply a particular machine learning approach.	Analyze (AN) Evaluate (E)
3	To mathematically analyse various machine learning approaches and paradigms	Create (C)

Detailed syllabus:

Module	Detailed Content	Hours	Cognitive levels of attainment as per Bloom's Taxonomy
Unit 1	Introduction to Supervised Learning and Unsupervised Learning, Applications of Machine Learning, Introduction to software tools for machine learning.	**10**	Analyze (AN)
Unit 2	Data Preprocessing: Get the dataset, Importing the Libraries, Importing the Dataset, Missing Data, Categorical Data, Splitting the Dataset into the Training set and Test set, Feature Scaling	**07**	Evaluate (E)
Unit 3	Regression: Simple Linear Regression, Multiple Linear Regression, Polynomial Regression, SVR, Decision Tree Regression, Random Forest Regression	**06**	Apply (A)
Unit 4	Classification: Logistic Regression, K-NN, SVM, Kernel SVM, Naive Bayes, Decision Tree Classification, Random Forest Classification, Clustering: K-Means, Hierarchical Clustering	**09**	Apply (A)
Unit 5	Association Rule Learning: Apriori, Reinforcement Learning: Upper Confidence Bound, Thompson Sampling.Introduction to Natural Language Processing and algorithms for NLP, Dimensionality Reduction: PCA, LDA, Kernel PCA,	**09**	Apply (A)
Unit 6	Introduction to Deep Learning: Artificial Neural Networks, Convolutional Neural Networks, Role of Machine learning in Information and Communications Technology Markets, Cognitive Computing in Communications, Applications, and Commerce,Machine learning for Intelligent Industrial Processes & Enabling ICT	**05**	Evaluate (E)

References:

1. Kevin Murphy, Machine Learning: A Probabilistic Perspective, MIT Press, 2012

2. Trevor Hastie, Robert Tibshirani, Jerome Friedman, The Elements of Statistical Learning, Springer 2009 (freely available online)

3. Christopher Bishop, Pattern Recognition and Machine Learning, Springer, 2007.

4. Udemy Curriculum

M.E. Semester –I
Choice Based Credit Grading Scheme (CBCGS 2019)

<table>
<tr><td colspan="5">ME (Information Technology)</td><td colspan="4">SEM : I</td></tr>
<tr><td colspan="5">Course Name : Data Storage Technologies and Networks</td><td colspan="4">Course Code : PEC-ITME10212</td></tr>
<tr><td colspan="5">Contact Hours Per Week : 03</td><td colspan="4">Credits : 03</td></tr>
<tr><td colspan="5">Teaching Scheme (Program Specific)</td><td colspan="4">Examination Scheme (Formative/ Summative)</td></tr>
<tr><td colspan="5">Modes of Teaching / Learning / Weightage</td><td colspan="4">Modes of Continuous Assessment / Evaluation</td></tr>
<tr><td colspan="5" rowspan="2">Hours Per Week</td><td colspan="2">Theory (100)</td><td>Practical/Oral (25)</td><td>Term Work (25)</td><td>Total</td></tr>
<tr><td>Theory</td><td>Tutorial</td><td>Practical</td><td>Contact Hours</td><td>Credits</td><td>IA</td><td>ESE</td><td>PR</td><td>TW</td><td rowspan="2">100</td></tr>
<tr><td>3</td><td>-</td><td>-</td><td>3</td><td>3</td><td>25</td><td>75</td><td>-</td><td>-</td></tr>
<tr><td colspan="9">IA: In-Semester Assessment - Paper Duration – 1.5 Hours
ESE : End Semester Examination - Paper Duration - 3 Hours</td></tr>
<tr><td colspan="9">Prerequisite: Basic knowledge of Computer Architecture, Operating Systems, and Computer Networking is required.</td></tr>
</table>

COURSE OBJECTIVE
To provide learners with a basic understanding of Enterprise Data Storage and Management Technologies

Course Outcomes: After completion of course, students would be:

Sr. No	Course Objectives	RBT Levels
1	Students will analyze the limitations of the client-server architecture and evaluate the need for data protection and storage ecentric architectures such as Intelligent storage system.	Apply, (A), Analyze (AN)
2	Students will understand, interpret and examine various SAN technologies.	Understand(U), Apply(A)
3	Students will describe and sketch the SAN architecture and its uses.	Apply(A), Analyze(AN)
4	Students will classify the applications as per their requirements and select relevant SAN solutions.	Apply(A), Analyze(AN)
5	Students will understand and evaluate different SAN management strategies to fulfill business continuity requirements.	Understand(U), Analyze(AN)
6	Students will design case studies on NAS, SAN and SAN/NAS	Create(C)

Detailed contents:

Sr. No.	Topics	Hrs.	Cognitive levels of attainment as per Bloom's Taxonomy
1	Introduction: Storage oriented architecture, Storage Systems, Data center Infrastructure, Challenges in managing information, Information life cycle; Basics of Storage System: Components of Storage System, Disk Drive components and Performance, Components of Host; Data Protection: Raid Components and types, RAID technologies and RAID levels, RAID impact on disk performance; Intelligent Storage System" Components of ISS, Storage Provisioning and types of ISS	8	Remember(R), Understand(U)
2	Network Hierarchy, Using a Modular Approach to Network Design, Storage on Network: NAS hardware and software architecture, NAS connectivity, NAS as a Storage System; NAS Hardware devices; NAS software components; NAS connectivity options: NAS connectivity hardware and Software Architecture.	9	Understand(U), Apply(A) Apply(A), Analyze(AN)
3	Architecture Overview: Creating Network for storage; Hardware devices: Fibre Channel Switch, Host Bus Adaptors, Putting the Storage in SANs, Fabric Operation from a hardware perspective, SAN hardware considerations ; Software Components: The switch's operating system, device drivers, the supporting components, considerations for SAN software; Configuration options for SANs: Connecting into the data center, the evolving network and device connections, SAN configuration guidelines	7	Understand(U), Apply(A) Understand(U), Apply(A), Analyze(AN)
4	Defining the I/O workload: Storage planning and capacity planning, the definition and characterization of workloads, the business application, I/O content and workloads, Considerations for I/O workloads in storage networking ; Applying SAN solution: SAN workload characterization, applying SAN to OLTP workloads, transactional workloads; Applying NAS solution: NAS workload characterization, applying NAS to departmental workloads, enterprise web workloads and specialized workloads; Considerations when integrating SN and NAS: Differences and similarities, the need to integrate, future storage connectivity and integration	9	Understand(U), Apply(A), Analyze(AN) Understand(U), Apply(A)
5	Planning business continuity: Defining the environment, the role of storage networking in business continuity, storage design and implementation of the business continuity planning ; Managing availability: Availability Metrics, Implementing the plan ; Maintaining Serviceability: Tracking the configurations, Investigating the changes and closing the loop on serviceability; Capacity Planning: Storage Analysis, developing and implementing plan for storage, Modelling performance and capacity requirements ; Security considerations: Overview of Information security, Security methods, Storage Security challenges, FC SAN security, NAS security	10	Apply(A), Analyze(AN) Understand(U), Apply(A)
6	Case studies on NAS, SAN, SAN/NAS	5	Understand(U), Apply(A), Analyze(AN)

References:

1. The Complete Guide to Data Storage Technologies for Network-centric Computing Paperback– Import, Mar 1998 by Computer Technology Research Corporation
2. Data Storage Networking: Real World Skills for the Comp TIA Storage by Nigel Poulton

M.E. Semester –I
Choice Based Credit Grading Scheme (CBCGS 2019)

<table>
<tr><td colspan="5">ME (Information Technology)</td><td colspan="4">SEM : I</td></tr>
<tr><td colspan="5">Course Name : Distributed Database</td><td colspan="4">Course Code : PEC-ITME102213</td></tr>
<tr><td colspan="5">Contact Hours Per Week : 03</td><td colspan="4">Credits : 03</td></tr>
<tr><td colspan="5">Teaching Scheme (Program Specific)</td><td colspan="4">Examination Scheme (Formative/ Summative)</td></tr>
<tr><td colspan="5">Modes of Teaching / Learning / Weightage</td><td colspan="4">Modes of Continuous Assessment / Evaluation</td></tr>
<tr><td colspan="5" rowspan="2">Hours Per Week</td><td colspan="2">Theory (100)</td><td>Practical/ Oral (25)</td><td>Term Work (25)</td><td rowspan="2">Total</td></tr>
<tr><td>Theory</td><td>Tutorial</td><td>Practical</td><td>Contact Hours</td><td>Credits</td><td>IA</td><td>ESE</td><td>PR</td><td>TW</td></tr>
<tr><td>3</td><td>-</td><td>-</td><td>3</td><td>3</td><td>25</td><td>75</td><td>-</td><td>-</td><td>100</td></tr>
<tr><td colspan="9">IA: In-Semester Assessment - Paper Duration – 1.5 Hours
ESE : End Semester Examination - Paper Duration - 3 Hours</td></tr>
<tr><td colspan="9">Prerequisite: Basic knowledge of Computer Architecture, Operating Systems, and Computer Networking is required.</td></tr>
</table>

COURSE OBJECTIVE:

The objective of course is to provide insight to distributed database, normalization techniques andintegrityrules.Italsoincludesparalleldatabasesystemsalongwithobjectorientedmodels.

Course Outcomes: After completion of course, students would be:

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)

Module No.	Topics	Hrs.	Cognitive levels of attainment as per Bloom's Taxonomy
1	Introduction: 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 Languages, Relational DBMS.	11	Analyze (AN)
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.	8	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.	9	Analyze (AN)
4	Parallel Database Systems: Database servers, Parallel architecture, Parallel DBMS Techniques, Parallel execution problems, Parallel execution for hierarchical architecture.	7	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.	8	Apply (A) Analyze (AN)
6	Recent approaches, models and current trends in improving the performance of Distributed Database.	5	Evaluate (E) Create (C)

References:

1. Principles of Distributed Database Systems, Second Edition, M.Tamer Ozsu Patrick Valduriez
2. Distributed Databases principles and systems, StefanoCeri, Giuseppe Pelagatti, Tata McGraw Hill.

M.E. Semester –I
Choice Based Credit Grading Scheme (CBCGS 2019)

ME (Information Technology)							**SEM :** I		
Course Name : Steganography and Digital Watermarking							**Course Code :** PEC-ITME102221		
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**									
Prerequisite: Cryptography									

COURSE OBJECTIVE:
The objective of course is to provide a insight to steganography techniques. Watermarking techniques along with attacks on data hiding and integrity of data is included in this course

COURSE OUTCOMES

Sr. No.	**Course Outcomes**	**Cognitive levels of attainment as per Bloom's Taxonomy**
1	Learn the concept of information hiding	Apply(A)
2	Survey of current techniques of steganography and learn how to detect and extract hidden information.	Evaluate (E)
3	Learn watermarking techniques and through examples understand the concept.	Analyze (AN)

Detailed syllabus:

Sr. No.	LECTURE WITH BREAKUP	Hrs.	Cognitive levels of attainment as per Bloom's Taxonomy
1	**Steganography:** Overview, History, Methods for hiding (text, images, audio, video, speech etc.), Issues: Security, Capacity and Imperceptibility, Steganalysis: Active and Malicious Attackers, Active and passive steganalysis,	8	Evaluate (E)
2	Frameworks for secret communication (pure Steganography, secret key, public key steganography), Steganography algorithms (adaptive and non-adaptive),	8	Apply(A)
	Steganography techniques: Substitution systems, Spatial Domain, Transform domain techniques, Spread spectrum, Statistical steganography, Cover Generation and cover selection, Tools: EzStego, FFEncode, Hide 4 PGP, Hide and Seek, S Tools etc.)	9	Analyze (AN)
4	Detection, Distortion, Techniques: LSB Embedding, LSB Steganalysis using primary sets, Texture based	6	Analyze (AN)
5	**Digital Watermarking**: Introduction, Difference between Watermarking and Steganography, History, Classification (Characteristics and Applications), Types and techniques (Spatial-domain, Frequency-domain, and Vector quantization based watermarking), Attacks and Tools (Attacks by Filtering, Remodulation, Distortion, Geometric Compression, Linear Compression etc.), Watermark security & authentication.	12	Apply(A)
6	**Unit 6:** Recent trends in Steganography and digital watermarking techniques. Case study of LSB Embedding, LSB Steg analysis using primary sets.	5	Evaluate (E)

References:

1. Peter Wayner, "Disappearing Cryptography–Information Hiding: Steganography & Watermarking", Morgan Kaufmann Publishers,NewYork, 2002.
2. Ingemar J. Cox, Matthew L. Miller, Jeffrey A. Bloom, Jessica Fridrich, TonKalker, "Digital WatermarkingandSteganography",MarganKaufmannPublishers,NewYork,2008.
3. Information Hiding: Steganography and Watermarking-Attacks and Countermeasures by Neil F. Johnson, ZoranDuric, SushilJajodia Information Hiding Techniques for Steganography and Digital Watermarking by Stefan Katzenbeisser, Fabien A. P.Petitcolas

M.E. Semester –I
Choice Based Credit Grading Scheme (CBCGS 2019)

ME (Information Technology)							**SEM :** I		
Course Name : Smart Sensors and Internet of things							**Course Code :** PEC-ITME102223, PEC-ITME102232		
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**									

COURSE OBJECTIVE
• Able to understand the application areas of IOT
• Able to realize the revolution of Internet in Mobile Devices, Cloud &Sensor Networks
• Able to understand building blocks of Internet of Things and characteristics

Course Outcomes: After completion of course, students would be:

Sr. No.	**Course Outcomes**	**Cognitive levels of attainment as per Bloom's Taxonomy**
1	Understand the vision of IoT from a global context.	Analyze (AN)
2	Determine the Market perspective of IoT.	Evaluate (E)
3	Use of Devices, Gateways and Data Management in IoT.	Apply (A)
4	Application of IoT in Industrial and Commercial Building Automation and Real World Design Constraints.	Apply (A)
5	Building state of the art architecture in IoT.	Create (C)

Detailed syllabus:

LECTURE WITH BREAKUP	Hrs.	Cognitive levels of attainment as per Bloom's Taxonomy
Unit 1: Environmental Parameters Measurement and Monitoring: Why measurement and monitoring are important, effects of adverse parameters for the living being for IOT	7	Analyze (AN)
Unit 2: Sensors: Working Principles: Different types; Selection of Sensors for Practical Applications Introduction of Different Types of Sensors such as Capacitive, Resistive, Surface Acoustic Wave for Temperature, Pressure, Humidity, Toxic Gas etc	8	Evaluate (E)
Unit 3: Important Characteristics of Sensors: Determination of the Characteristics Fractional order element: Constant Phase Impedance for sensing applications such as humidity, water quality, milk quality Impedance Spectroscopy: Equivalent circuit of Sensors and Modelling of SensorsImportance and Adoption of Smart Sensors	11	Analyze (AN)
Unit 4: Architecture of Smart Sensors: Important components, their features Fabrication of Sensor and Smart Sensor: Electrode fabrication: Screen printing, Photolithography, Electroplating Sensing film deposition: Physical and chemicalVapor, Anodization, Sol-gel	10	Analyze (AN) Apply (A)
Unit 5: Interface Electronic Circuit for Smart Sensors and Challenges forInterfacing the Smart Sensor, Usefulness of Silicon Technology in Smart Sensor And Future scope of research in smart sensor	7	Analyze (AN) Create (C)
Unit 6: Recent trends in smart sensor for day to day life, evolving sensors and their architecture.	5	Evaluate (E)

References:

1. Yasuura, H., Kyung, C.-M., Liu, Y., Lin, Y.-L., Smart Sensors at the IoT Frontier, Springer International Publishing
2. Kyung, C.-M., Yasuura, H., Liu, Y., Lin, Y.-L., Smart Sensors and Systems, Springer International Publishing

M.E. Semester –I
Choice Based Credit Grading Scheme (CBCGS 2019)

ME (Information Technology)							**SEM :** I		
Course Name : Logic and Functional Programming							**Course Code :** PEC-ITME102233		
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**									
Prerequisite: Discrete Mathematics, Applied Mathematics, Programming Skills									

COURSE OBJECTIVE
• To further the state of the art on the theoretical and practical aspects of developing declarative programming tools in logic programming for IOT data analysis.
• To introduce basics of functional programming and constraint logic programming for nodes in IOT.
• Introduction into formal concepts used as a theoretical basis for both paradigms, basic knowledge and practical experience.

COURSE OUTCOMES: After completion of course, students would be:

Sr. No.	**Course Outcomes**	**Cognitive levels of attainment as per Bloom's Taxonomy**
1	Understanding of the theory and practice of functional and logic programming For IOT.	Remember (R), Understand (U)
2	The ability to write functional and logic programs for nodes in IOT.	Remember (R), Understand (U), Apply (A)
3	The ability to solve problems in and using functional and logic programming.	Remember (R), Understand (U), Apply (A), Analyze (AN)

Detailed syllabus:

Sr. No.	LECTURE WITH BREAKUP	Hrs.	Cognitive levels of attainment as per Bloom's Taxonomy
1	**Proposition Logic:** Introduction of logic and Functional Paradigm, Propositional Concepts, Semantic Table , Problem Solving with Semantic Table.	5	Remember (R), Understand (U)
2	**Natural Deduction and Axiomatic Propositional Logic:** Rules of Natural Deduction, Sequent Calculus, Axiomatic Systems, Meta theorems, Important Properties of AL, Resolution, Resolving Arguments	7	Remember (R), Understand (U), Apply (A)
3	**Introduction to Predicate Logic** Objects, Predicates and Quantifiers, Functions, First Order Language, Quantifiers, Scope and Binding, Substitution, An Axiomatic System for First Order Predicate Logic, Soundness and Completeness, Axiomatic Semantic and programming	9	Remember (R), Understand (U), Apply (A)
4	**Semantic Tableaux & Resolution in Predicate Logic:** Semantic Tableaux, Instantiation Rules, Problem-solving in Predicate Logic, Normal forms, Herbrand Universes and H-interpretation, Resolution, Unification, Resolution as a computing Tool, Nondeterministic Programming, Incomplete Data Structure, Second Order Programming in Prolog, Logic Grammars: Definite Clause Grammar, A Grammar Interpreter.	13	Remember (R), Understand (U), Apply (A), Analyze(AN)
5	**Lazy and Eager Evaluation strategies:** Evaluation Strategies, Lazy Evaluation: Evaluation Order and strictness of function, Programming with lazy evaluation, Interactive functional program, Delay of unnecessary Computation, Infinite Data Structure, Eager Evaluation and Reasoning	9	Remember (R), Understand (U), Apply (A),
6	Recent trends in logical and functional programming, predicate logics and various evaluation strategies.	5	Remember (R), Understand (U), Apply (A), Analyze(AN)

References:

1. John Kelly, "The Essence of Logic", Prentice-Hall India.
2. SarojKaushik, "Logic and Prolog Programming", New Age International ltd.

M.E. Semester –I
Choice Based Credit Grading Scheme (CBCGS 2019)

<table>
<tr><td colspan="6">ME (Information Technology)</td><td colspan="4">SEM : I</td></tr>
<tr><td colspan="6">Course Name : Advanced Network Security</td><td colspan="4">Course Code : PEC-ITME102241</td></tr>
<tr><td colspan="6">Contact Hours Per Week : 03</td><td colspan="4">Credits : 03</td></tr>
<tr><td colspan="6">Teaching Scheme (Program Specific)</td><td colspan="4">Examination Scheme (Formative/ Summative)</td></tr>
<tr><td colspan="6">Modes of Teaching / Learning / Weightage</td><td colspan="4">Modes of Continuous Assessment / Evaluation</td></tr>
<tr><td colspan="6">Hours Per Week</td><td>Theory (100)</td><td>Pract ical/Oral (25)</td><td>Term Work (25)</td><td>Total</td></tr>
<tr><td>Theory</td><td>Tutorial</td><td>Practical</td><td>Contact Hours</td><td>Credits</td><td>IA</td><td>ESE</td><td>PR</td><td>TW</td><td rowspan="2">100</td></tr>
<tr><td>3</td><td>-</td><td>-</td><td>3</td><td>3</td><td>25</td><td>75</td><td>-</td><td>-</td></tr>
<tr><td colspan="10">IA: In-Semester Assessment - Paper Duration – 1.5 Hours
ESE : End Semester Examination - Paper Duration - 3 Hours</td></tr>
<tr><td colspan="10">Prerequisite: Computer Basics, Procedural Programming Languages</td></tr>
</table>

Course Objective:

1. The purpose of this course is to provide understanding of the main issues related to security in modern networked computer systems.
2. This covers underlying concepts and foundations of computer security, basic knowledge about security-relevant decisions in designing IT infrastructures, techniques to secure complex systems and practical skills in managing a range of systems, from personal laptop to large-scale infrastructures.

COURSE OUTCOMES: After completion of course, students would be:

Sr. No.	Course Outcomes	Cognitive levels of attainment as per Bloom's Taxonomy
1	A good understanding of the concepts and foundations of computer security.	Understand(U)
2	Identify vulnerabilities of IT systems. The students can use basic security tools to enhance system security and can develop basic security enhancements in stand-alone applications.	Understand(U) Apply(A)

Detailed Syllabus:

Sr. No	Detailed Content	Hrs.	Cognitive levels of attainment as per Bloom's Taxonomy
1	**Computer Security Concepts**- Introduction to Information Security, Introduction to Data and Network Security, Integrity, and Availability, NIST FIPS 199 Standard, Assets and Threat Models, Examples **Control Hijacking–** Attacks and defenses, Buffer overflow nd control hijacking attacks	**7**	Understand(U)
2	**Exploitation techniques and fuzzing**- Finding vulnerabilities and exploits **Dealing with Legacy code-** Dealing with bad (legacy) application code: Sandboxing and Isolation. **Least privilege, access control, operating system security-** The principle of least privilege, Access control concepts, Operating system mechanisms, Unix, Windows, Qmail, Chromium, and Android examples.	**7**	Understand(U) Apply(A)
3	**Basic web security model-** Browser content, Document object model (DOM), Same-origin policy. **Web Application Security-** SQL injection, Cross-site request forgery, Cross-site scripting, Attacks and Defenses, Generating and storing session tokens, Authenticating users, The SSL protocol, The lock icon, User interface attacks, Pretty Good Privacy.	**8**	Understand(U) Apply(A)
4	**Network Protocols and Vulnerabilities-** Overview of basic networking infrastructure and network protocols, IP, TCP, Routing protocols, DNS. **Network Defenses-** Network defense tools, Secure protocols, Firewalls, VPNs, Tor, I2P, Intrusion Detection and filters, Host-Based IDS vs Network-Based IDS, Dealing with unwanted traffic: Denial of service attacks	**11**	Understand(U) Apply(A)
5	**Malicious Software and Software Security-** Malicious Web, Internet Security Issues, Types of Internet Security Issues, Computer viruses, Spyware, Key-Loggers, Secure Coding, Electronic and Information Warfare. **Mobile platform security models-** Android, iOS Mobile platform security models, Detecting Android malware in Android markets.	**10**	Understand(U) Apply(A) Analyze(AN)
6	**Security Risk Management-** How Much Security Do You Really Need, Risk Management, Information Security Risk Assessment: Introduction, Information Security Risk Assessment: Case Studies, Risk Assessment in Practice. **The Trusted Computing Architecture-** Introduction to Trusted Computing, TPM Provisioning, Exact Mechanics of TPM.	**5**	Understand(U) Apply(A) Analyze(AN)

Text books and References:

1. William Stallings, Network Security Essentials: Applications and Standards, Prentice Hall, 4th edition, 2010.
2. Michael T. Goodrich and Roberto Tamassia, Introduction to Computer Security, Addison Wesley, 2011.
3. William Stallings, Network Security Essentials: Applications and Standards, Prentice Hall, 4th edition, 2010.
4. Alfred J. Menezes, Paul C. van Oorschot and Scott A. Vanstone, Handbook of Applied Cryptography, CRC Press, 2001.

M.E. Semester –I

Choice Based Credit Grading Scheme (CBCGS 2019)

ME (Information Technology)							**SEM :** I		
Course Name : Cloud Computing							**Course Code :** PEC-ITME102242		
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**									
Prerequisite: OSI Layers, Basics of Operating system, Computer Networks									

COURSE OBJECTIVE
• The student will also learn how to apply trust-based security model to real-world security problems.
• An overview of the concepts, processes, and best practices needed to successfully secure information within Cloud infrastructures.
• Students will learn the basic Cloud types and delivery models and develop an understanding of the risk and compliance responsibilities and Challenges for each Cloud type and service delivery model.

Course Outcomes: After completion of course, students would be:

Sr. No.	**Course Outcomes**	**Cognitive levels of attainment as per Bloom's Taxonomy**
1	Identify security aspects of each cloud model	Understand(U), Apply(A), Evaluate(E)
2	Develop a risk-management strategy for moving to the Cloud	Understand(U), Apply (A), Create(C)
3	Implement a public cloud instance using a public cloud service provider	Understand(U), Apply (A), Create(C)

4	Apply trust-based security model to different layer	Understand(U), Apply (A), Apply(A)

Detailed syllabus:

Sr. No.	LECTURE WITH BREAKUP	Hrs.	Cognitive levels of attainment as per Bloom's Taxonomy
1	**Introduction to Cloud Computing** Online Social Networks and Applications, Cloud introduction and overview, Different clouds, Risks, Novel applications of cloud computing	4	Understand(U), Evaluate(E)
2	**Cloud Computing Architecture** Requirements, Introduction Cloud computing architecture, On Demand Computing Virtualization at the infrastructure level,Security in Cloud computing environments, CPU Virtualization, A discussion on Hypervisors Storage Virtualization Cloud Computing Defined, The SPI Framework for Cloud Computing, The Traditional Software Model, The Cloud Services Delivery Model **Cloud Deployment Models** Key Drivers to Adopting the Cloud, The Impact of Cloud Computing on Users, Governance in the Cloud, Barriers to Cloud Computing Adoption in the Enterprise	11	Understand(U), Create (C)
3	**Security Issues in Cloud Computing** Infrastructure Security, Infrastructure Security: The Network Level, The Host Level, The Application Level, Data Security and Storage, Aspects of Data Security, Data Security Mitigation Provider Data and Its Security **Identity and Access Management** Trust Boundaries and IAM, IAM Challenges, Relevant IAM Standards and Protocols for Cloud Services, IAM Practices in the Cloud, Cloud Authorization Management	10	Understand(U), Create (C) Evaluate (E)
4	**Security Management in the Cloud** Security Management Standards, Security Management in the Cloud, Availability Management: SaaS, PaaS, IaaS **Privacy Issues** Privacy Issues, Data Life Cycle, Key Privacy Concerns in the Cloud, Protecting Privacy, Changes to Privacy Risk Management and Compliance in Relation to Cloud Computing, Legal and Regulatory Implications, U.S. Laws and Regulations, International Laws and Regulations	11	Understand(U), Evaluate (E) Apply(A)
5	**Audit and Compliance** Internal Policy Compliance, Governance, Risk, and Compliance (GRC), Regulatory/External Compliance, Cloud Security Alliance, Auditing the Cloud for Compliance, Security-as-a-Cloud	8	Understand(U), Evaluate (E)
6	**ADVANCED TOPICS** Recent developments in hybrid cloud and cloud security.	4	Understand(U),

References:

1. Cloud Computing Explained: Implementation Handbook for Enterprises, John Rhoton, Publication Date: November 2,2009
2. Cloud Security and Privacy: An Enterprise Perspective on Risks and Compliance (Theory in Practice),Tim Mather, ISBN-10: 0596802765,O'Reilly Media, September2009

M.E. Semester –I
Choice Based Credit Grading Scheme (CBCGS 2019)

IT (Information Technology)							**SEM :** I		
Course Name : Research Methodology & IPR							**Course Code :MC-ITME101**		
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**									
Prerequisite: Discrete Mathematics									

Objectives:

1. To understand Research and Research Process
2. To acquaint students with identifying problems for research and develop research strategies
3. To familiarize students with the techniques of data collection, analysis of data and interpretation

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

	better products, and in turn brings about, economic growth and social benefits.	

Detailed Content:

Sr. No.	Detailed Contents	Hrs	Cognitive levels of attainment as per Bloom's Taxonomy
01	Meaning of research problem, Sources of research problem, Criteria Characteristics of a good research problem, Errors in selecting a research problem, Scope and objectives of research problem. Approaches of investigation of solutions for research problem, data collection, analysis, interpretation, Necessary instrumentations	4	Apply (A)
02	Effective literature studies approaches, analysis Plagiarism, Research ethics,	4	Analyze (An)
03	Effective technical writing, how to write report, Paper Developing a Research Proposal, Format of research proposal, a presentation and assessment by a review committee	4	Apply (A)
04	Nature of Intellectual Property: Patents, Designs, Trade and Copyright. Process ofPatenting and Development: technological research, innovation, patenting, development.International Scenario: International cooperation on Intellectual Property. Procedure for grantsof patents, Patenting under PCT.	4	Apply (A)
05	Patent Rights: Scope of Patent Rights. Licensing and transfer of technology. Patentinformation and databases. Geographical Indications.	4	Apply (A)
06	New Developments in IPR: Administration of Patent System. New developments inIPR; IPR of Biological Systems, Computer Software etc. Traditional knowledge Case Studies,IPR and IITs.	4	Apply (A)

REFERENCES:

1. Stuart Melville and Wayne Goddard, "Research methodology: an introduction for science & engineering students'"
2. Wayne Goddard and Stuart Melville, "Research Methodology: An Introduction"
3. Ranjit Kumar, 2 nd Edition , "Research Methodology: A Step by Step Guide for beginners"
4. Halbert, "Resisting Intellectual Property", Taylor & Francis Ltd , 2007.
5. Mayall , "Industrial Design", McGraw Hill, 1992.
6. Niebel , "Product Design", McGraw Hill, 1974.
7. Asimov, "Introduction to Design", Prentice Hall, 1962.
8. Robert P. Merges, Peter S. Menell, Mark A. Lemley, "Intellectual Property in New Technological Age", 2016.
9. T. Ramappa, "Intellectual Property Rights Under WTO", S. Chand, 2008

M.E. Semester –I
Choice Based Credit Grading Scheme (CBCGS 2019)

ME (Information Technology)							**SEM :** I		
Course Name : English for research paper writing							**Course Code :**AC-ITME001		
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

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 –I
Choice Based Credit Grading Scheme (CBCGS 2019)

<table>
<tr><td colspan="7">ME (Information Technology)</td><td colspan="4">SEM : I</td></tr>
<tr><td colspan="7">Course Name :Disaster management</td><td colspan="4">Course Code : AC-ITME002</td></tr>
<tr><td colspan="5">Teaching Scheme (Program Specific)</td><td colspan="6">Examination Scheme (Formative/ Summative)</td></tr>
<tr><td colspan="5">Modes of Teaching / Learning / Weightage</td><td colspan="6">Modes of Continuous Assessment / Evaluation</td></tr>
<tr><td colspan="5">Hours Per Week</td><td colspan="2">Theory (100)</td><td>Practical/ Oral (25)</td><td>Term Work (50)</td><td>Total</td></tr>
<tr><td>Theory</td><td>Tutorial</td><td>Practical</td><td>Contact Hours</td><td>Credits</td><td>IA</td><td>ESE</td><td>PR/OR</td><td>TW</td><td rowspan="2">50</td></tr>
<tr><td>2</td><td>-</td><td>-</td><td>2</td><td>-</td><td>-</td><td>-</td><td>-</td><td>50</td></tr>
<tr><td colspan="10">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%)</td></tr>
</table>

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, PardeepEt.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

M.E. Semester –I
Choice Based Credit Grading Scheme (CBCGS 2019)

<table>
<tr><td colspan="8">ME (Information Technology)</td><td colspan="4">SEM: I</td></tr>
<tr><td colspan="8">Course Name: Sanskrit for technical knowledge</td><td colspan="4">Course Code: AC-ITME003</td></tr>
<tr><td colspan="5">Teaching Scheme (Program Specific)</td><td colspan="7">Examination Scheme (Formative/ Summative)</td></tr>
<tr><td colspan="5">Modes of Teaching / Learning / Weightage</td><td colspan="7">Modes of Continuous Assessment / Evaluation</td></tr>
<tr><td colspan="5">Hours Per Week</td><td colspan="2">Theory (100)</td><td>Practical/ Oral (25)</td><td>Term Work (50)</td><td>Total</td></tr>
<tr><td>Theory</td><td>Tutorial</td><td>Practical</td><td>Contact Hours</td><td>Credits</td><td>IA</td><td>ESE</td><td>PR/OR</td><td>TW</td><td rowspan="2">50</td></tr>
<tr><td>2</td><td>-</td><td>-</td><td>2</td><td>-</td><td>-</td><td>-</td><td>-</td><td>50</td></tr>
<tr><td colspan="10">IA: In Semester Assessment</td></tr>
<tr><td colspan="10">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%)</td></tr>
</table>

Course objectives:
1To 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.
1.0	Alphabets in Sanskrit,Past/Present/Future Tense,Simple Sentences	8
2.0	Order, Introduction of roots, Technical information about Sanskrit Literature.	8
3.0	Technical concepts of Engineering-Electrical, Mechanical,Architecture, Mathematics	8

Reference Books:
1. “Abhyaspustakam” – Dr.Vishwas, Samskrita-Bharti Publication, New Delhi
2. “Teach Yourself Sanskrit” PrathamaDeeksha-VempatiKutumbshastri, Rashtriya Sanskrit Sansthanam, New Delhi Publication
3. “India’s Glorious Scientific Tradition” Suresh Soni, Ocean books (P) Ltd., New Delhi.

M.E. Semester –I
Choice Based Credit Grading Scheme (CBCGS 2019)

<table>
<tr><td colspan="6">ME (Information Technology)</td><td colspan="4">SEM : I</td></tr>
<tr><td colspan="6">Course Name : Value Education</td><td colspan="4">Course Code :AC-ITME004</td></tr>
<tr><td colspan="6">Teaching Scheme (Program Specific)</td><td colspan="4">Examination Scheme (Formative/ Summative)</td></tr>
<tr><td colspan="6">Modes of Teaching / Learning / Weightage</td><td colspan="4">Modes of Continuous Assessment / Evaluation</td></tr>
<tr><td colspan="6">Hours Per Week</td><td>Theory (100)</td><td>Practical/Oral (25)</td><td>Term Work (50)</td><td>Total</td></tr>
<tr><td>Theory</td><td>Tutorial</td><td>Practical</td><td>Contact Hours</td><td>Credits</td><td>IA</td><td>ESE</td><td>PR/OR</td><td>TW</td><td rowspan="2">50</td></tr>
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<tr><td colspan="10">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%)</td></tr>
</table>

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)

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. Doing best for saving nature	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. Honesty, Studying effectively	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 –I
Choice Based Credit Grading Scheme (CBCGS 2019)

<table>
<tr><td colspan="5">ME (Information Technology)</td><td colspan="4">SEM: I</td></tr>
<tr><td colspan="5">Course Name: Constitution of India</td><td colspan="4">Course Code:AC-ITME005</td></tr>
<tr><td colspan="5">Teaching Scheme (Program Specific)</td><td colspan="4">Examination Scheme (Formative/ Summative)</td></tr>
<tr><td colspan="5">Modes of Teaching / Learning / Weightage</td><td colspan="4">Modes of Continuous Assessment / Evaluation</td></tr>
<tr><td colspan="5">Hours Per Week</td><td>Theory (100)</td><td>Practical/Oral (25)</td><td>Term Work (50)</td><td>Total</td></tr>
<tr><td>Theory</td><td>Tutorial</td><td>Practical</td><td>Contact Hours</td><td>Credits</td><td>IA</td><td>ESE</td><td>PR/OR</td><td>TW</td><td rowspan="2">50</td></tr>
<tr><td>2</td><td>-</td><td>-</td><td>2</td><td>-</td><td>-</td><td>-</td><td>-</td><td>50</td></tr>
<tr><td colspan="9">IA: In Semester Assessment</td></tr>
<tr><td colspan="9">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%)</td></tr>
</table>

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 thearrival 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: ZilaPachayat. Elected officials and their roles, CEO ZilaPachayat: 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 –I
Choice Based Credit Grading Scheme (CBCGS 2019)

<table>
<tr><td colspan="5">ME (Information Technology)</td><td colspan="4">SEM: I</td></tr>
<tr><td colspan="5">Course Name: Pedagogy studies</td><td colspan="4">Course Code: AC-ITME006</td></tr>
<tr><td colspan="5">Teaching Scheme (Program Specific)</td><td colspan="4">Examination Scheme (Formative/ Summative)</td></tr>
<tr><td colspan="5">Modes of Teaching / Learning / Weightage</td><td colspan="4">Modes of Continuous Assessment / Evaluation</td></tr>
<tr><td colspan="5">Hours Per Week</td><td>Theory (100)</td><td>Practical/Oral (25)</td><td>Term Work (50)</td><td>Total</td></tr>
<tr><td>Theory</td><td>Tutorial</td><td>Practical</td><td>Contact Hours</td><td>Credits</td><td>IA</td><td>ESE</td><td>PR/OR</td><td>TW</td><td rowspan="2">50</td></tr>
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<tr><td colspan="9">IA: In Semester Assessment</td></tr>
<tr><td colspan="9">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%)</td></tr>
</table>

Course objectives:

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

2. Identify critical evidence gaps to guide the development.

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:

1Ackers 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 –I
Choice Based Credit Grading Scheme (CBCGS 2019)

ME (Information Technology)							**SEM:** I		
Course Name: Stress management by yoga							**Course Code:** AC-ITME007		
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 Pranayami) 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 Yoga bhyasiMandal, Nagpur
2. "Rajayoga or conquering the Internal Nature" by Swami Vivekananda, Advaita Ashrama (Publication Department), Kolkata

M.E. Semester –I
Choice Based Credit Grading Scheme (CBCGS 2019)

<table>
<tr><td colspan="5">ME (Information Technology)</td><td colspan="4">SEM: I</td></tr>
<tr><td colspan="5">Course Name: Personality development through life enlightenment skills</td><td colspan="4">Course Code: AC-ITME008</td></tr>
<tr><td colspan="5">Teaching Scheme (Program Specific)</td><td colspan="4">Examination Scheme (Formative/ Summative)</td></tr>
<tr><td colspan="5">Modes of Teaching / Learning / Weightage</td><td colspan="4">Modes of Continuous Assessment / Evaluation</td></tr>
<tr><td colspan="5">Hours Per Week</td><td>Theory (100)</td><td>Practical/Oral (25)</td><td>Term Work (50)</td><td>Total</td></tr>
<tr><td>Theory</td><td>Tutorial</td><td>Practical</td><td>Contact Hours</td><td>Credits</td><td>IA</td><td>ESE</td><td>PR/OR</td><td>TW</td><td rowspan="2">50</td></tr>
<tr><td>2</td><td>-</td><td>-</td><td>2</td><td>-</td><td>-</td><td>-</td><td>-</td><td>50</td></tr>
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<tr><td colspan="9">ESE: End Semester Examination
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</table>

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:

Students will be able to:

1. Study of Shrimad-Bhagwad-Geeta will help the student in developing his personality andachieve 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. ShrimadBhagwadGeeta : 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. ShrimadBhagwadGeeta: Chapter2-Verses 56, 62, 68 Chapter 12 -Verses 13, 14, 15, 16,17, 18 Personality of Role model. ShrimadBhagwadGeeta: Chapter2-Verses 17, Chapter 3-Verses 36,37,42, Chapter 4-Verses 18, 38,39 Chapter18 – Verses 37,38,63	8

Reference Books:

1. "Srimad Bhagavad Gita" by Swami SwarupanandaAdvaita 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 –I
Choice Based Credit Grading Scheme (CBCGS 2019)

<table>
<tr><td colspan="5">ME (Information Technology)</td><td colspan="4">SEM: I</td></tr>
<tr><td colspan="5">Course Name: Laboratory I</td><td colspan="4">Course Code: 1IT03</td></tr>
<tr><td colspan="5">Contact Hours Per Week: 04</td><td colspan="4">Credits: 02</td></tr>
<tr><td colspan="5">Teaching Scheme (Program Specific)</td><td colspan="4">Examination Scheme (Formative/ Summative)</td></tr>
<tr><td colspan="5">Modes of Teaching / Learning / Weightage</td><td colspan="4">Modes of Continuous Assessment / Evaluation</td></tr>
<tr><td colspan="5">Hours Per Week</td><td colspan="2">Theory (100)</td><td>Practical/Oral (25)</td><td>Term Work (25)</td><td>Total</td></tr>
<tr><td>Theory</td><td>Tutorial</td><td>Practical</td><td>Contact Hours</td><td>Credits</td><td>IA</td><td>ESE</td><td>PR</td><td>TW</td><td rowspan="2">50</td></tr>
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<tr><td colspan="9">IA: In-Semester Assessment - Paper Duration – 1.5 Hours
ESE : End Semester Examination - Paper Duration - 3 Hours</td></tr>
<tr><td colspan="9">The weightage of marks for continuous evaluation of Term work/Report: Formative (40%), Timely completion of Practical (40%) and Attendance (20%)</td></tr>
</table>

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

M.E. Semester –I
Choice Based Credit Grading Scheme (CBCGS 2019)

<table>
<tr><td colspan="6">ME (Information Technology)</td><td colspan="4">SEM: I</td></tr>
<tr><td colspan="6">Course Name: Laboratory 2</td><td colspan="4">Course Code: 1IT04</td></tr>
<tr><td colspan="6">Contact Hours Per Week: 04</td><td colspan="4">Credits: 02</td></tr>
<tr><td colspan="6">Teaching Scheme (Program Specific)</td><td colspan="4">Examination Scheme (Formative/ Summative)</td></tr>
<tr><td colspan="6">Modes of Teaching / Learning / Weightage</td><td colspan="4">Modes of Continuous Assessment / Evaluation</td></tr>
<tr><td colspan="5">Hours Per Week</td><td colspan="2">Theory (100)</td><td>Practical/Oral (25)</td><td>Term Work (25)</td><td>Total</td></tr>
<tr><td>Theory</td><td>Tutorial</td><td>Practical</td><td>Contact Hours</td><td>Credits</td><td>IA</td><td>ESE</td><td>PR</td><td>TW</td><td rowspan="2">50</td></tr>
<tr><td>-</td><td>-</td><td>4</td><td>4</td><td>2</td><td>-</td><td>-</td><td>25</td><td>25</td></tr>
<tr><td colspan="10">IA: In-Semester Assessment - Paper Duration – 1.5 Hours
ESE : End Semester Examination - Paper Duration - 3 Hours</td></tr>
<tr><td colspan="10">The weightage of marks for continuous evaluation of Term work/Report: Formative (40%), Timely completion of Practical (40%) and Attendance (20%)</td></tr>
</table>

Each Laboratory assignment will be done by an individual student. The Faculty teaching core subject 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

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

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. [illegible]	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

<table>
<tr><td colspan="8">ME (Information Technology)</td><td colspan="4">SEM: II</td></tr>
<tr><td colspan="8">Course Name: Constitution of India</td><td colspan="4">Course Code:2AAE5</td></tr>
<tr><td colspan="5">Teaching Scheme (Program Specific)</td><td colspan="7">Examination Scheme (Formative/ Summative)</td></tr>
<tr><td colspan="5">Modes of Teaching / Learning / Weightage</td><td colspan="7">Modes of Continuous Assessment / Evaluation</td></tr>
<tr><td colspan="5" rowspan="2">Hours Per Week</td><td colspan="2">Theory (100)</td><td colspan="2">Practical/Oral (25)</td><td>Term Work (50)</td><td>Total</td></tr>
<tr><td>Theory</td><td>Tutorial</td><td>Practical</td><td>Contact Hours</td><td>Credits</td><td>IA</td><td>ESE</td><td colspan="2">PR/OR</td><td>TW</td><td rowspan="2">50</td></tr>
<tr><td>2</td><td>-</td><td>-</td><td>2</td><td>-</td><td>-</td><td>-</td><td colspan="2">-</td><td>50</td></tr>
<tr><td colspan="10">IA: In Semester Assessment</td></tr>
<tr><td colspan="10">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%)</td></tr>
</table>

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. 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	8

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

<table>
<tr><td colspan="5">ME (Information Technology)</td><td colspan="5">SEM: II</td></tr>
<tr><td colspan="5">Course Name: Laboratory III</td><td colspan="5">Course Code: 2IT07</td></tr>
<tr><td colspan="5">Contact Hours Per Week: 04</td><td colspan="5">Credits: 02</td></tr>
<tr><td colspan="5">Teaching Scheme (Program Specific)</td><td colspan="5">Examination Scheme (Formative/ Summative)</td></tr>
<tr><td colspan="5">Modes of Teaching / Learning / Weightage</td><td colspan="5">Modes of Continuous Assessment / Evaluation</td></tr>
<tr><td colspan="5">Hours Per Week</td><td colspan="2">Theory (100)</td><td>Practical/Oral (25)</td><td>Term Work (25)</td><td>Total</td></tr>
<tr><td>Theory</td><td>Tutorial</td><td>Practical</td><td>Contact Hours</td><td>Credits</td><td>IA</td><td>ESE</td><td>PR</td><td>TW</td><td rowspan="2">50</td></tr>
<tr><td>-</td><td>-</td><td>4</td><td>4</td><td>2</td><td>-</td><td>-</td><td>25</td><td>25</td></tr>
<tr><td colspan="10">IA: In-Semester Assessment
ESE : End Semester Examination</td></tr>
<tr><td colspan="10">The weightage of marks for continuous evaluation of Term work/Report: Formative (40%), Timely completion of Practical (40%) and Attendance (20%)</td></tr>
</table>

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**	**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 elective subject will be required to propose the respective Laboratory assignments. These will be essentially hands-on practical /Case Study.