Syllabus of New Courses of MTech

Computer Science and Engineering

2015 to 2020

Course Code: **16ECSE707**	Course Title: **Cryptography and Network Security**	
L-T-P: **3-0-0**	Credits: 3	Contact Hrs: 42
ISA Marks: 50	ESA Marks: 50	Total Marks: 100
Teaching Hrs: 3		Exam Duration: 3 hrs

Ch. No	Content	Hrs
1	**Network Security Overview** **Common Attacks and Defense Mechanisms:** Eavesdropping, Cryptanalysis Password Pilfering, Identity Spoofing, Buffer-Overflow Exploitations, Repudiation, Intrusion, Traffic Analysis, Denial of Service Attacks, Marvelous Software. **Attacker Profiles:** Hackers, Script Kiddies, Cyber Spies, VICIOUS Employees, Cyber Terrorists, Hypothetical Attackers. **Basic Security Model.**	05
2	**Data Encryption Algorithms**	07

	Data Encryption Algorithm Design Criteria: ASCII Code, XOR Encryption, Criteria of Data Encryptions, implementation Criteria. **Data Encryption Standard :** Feistel's Cipher Scheme , DES Subkeys, DES Substitution Boxes , DES Encryption , DES Decryption and Correctness Proof., DES Security Strength. **Multiple DES**. **Advanced Encryption Standard:** AES Basic Structures., AES S-Boxes 60, AES-128 Round Keys , Add Round Keys Substitute-Byt, Shift-Ro, Mix-Colum, AES-128 Encryption, AES-128 Decryption and Correctness Proof, Galois Fields, Construction of the AES S-Box and Its Inverse , AES Security Strength. **Standard Block-Cipher Modes of Operations:** Electronic-Codebook Mode, Cipher-Block-Chaining Mode, Cipher-Feedback Mode Output-Feedback Mode, Counter Mode. **Stream Ciphers:** RC4 Stream Cipher, RC4 Security Weaknesses. **Key Generations**.	
3	**Public-Key Cryptography and Key Management** **Concepts of Public-Key Cryptography, Elementary Concepts and Theorems In Number Theory**: Modular Arithmetic and Congruence Re1attons, Modular Inverse. **Diffie-Hellman Key Exchange**, Key Exchange Protocol , Man-in-the-Middle Attacks , Elgamal PKC. **RSA Cryptosystem :** RSA Key Pairs, Encryptions, and Decryptions , RSA Parameter Attacks RSA Challenge Numbers. **Key Distributions and Management**: Master Keys and Session Keys , Public-Key Certificates CA Networks, Key Rings.	**05**
4	**Data Authentication**	**07**

	Cryptographic Hash Functions: Design Criteria of Cryptographic Hash F Unctions , Quest for Cryptographic Hash Functions, Basic Structure of Standard Hash Functions , SHA-512 , WHIRLPOOL , **Cryptographic Checksums**: Exclusive-OR Cryptographic Checksums , Design Criteria of MAC Algorithms , Data Authentication Algorithm. **HMAC :** Design Criteria of HMAC , HMAC Algorithm, **Offset Codebook Mode of Operations**: Basic Operations , OCB Encryption and Tag Generation , OCB Decryption and Tag Verification. **Birthday Attacks**: Complexity Upper Bound of Breaking Strong Collision, Resistance, Set Intersection Attack. **Digital Signature Standard, Dual Signatures and Electronic Transactions:** Dual Signature Applications, Dual Signatures and Electronic Transactions, **Blind Signatures and Electronic Cash:** RSA Blind Signatures , Electronic Cash .	
5	**Network Security Protocols in Practice** **Crypto Placements in Networks:** Crypto Placement at the Application Layer , Crypto Placement at the Transport Layer , Crypto Placement at the Network Layer , Crypto Placement at the Data-Link Layer , Hardware versus Software Implementations of, Cryptographic Algorithms. **Public-Key Infrastructure**: X.509 Public-Key Infrastructure , X.509 Certificate Formats **, IPsec: A Security Protocol at the Network Layer:** Security Association, Application Modes and Security Associations , AH Format , ESP Format Secret Key Determination and Distribution.	**06**
6	**Security Protocols at Transport and Application Layers**	**04**

	SSL Handshake Protocol , SSL Record Protocol. **PGP and SIMIME**: **Email Security Protocols**: Basic Email Security Mechanisms. PGP, S/MIME. **Kerberos' An Authentication Protocol:** Basic Ideas , Smgle-Realm Kerberos , Multiple-Realm Kerberos , **SSH: Security Protocols for Remote Logins .**	
7	**Wireless Network Security -1:** **Wireless Communications and 802 11 WLAN Standards:** WLAN Architecture, 802.11 Essentials Wireless Security Vulnerabilities. **WEP**: Device Authentication and Access Control, Data Integrity Check LLC Frame Encryption, Security Flaws of WEP. **WPA:** Device Authentication and Access Controls, TKIP Key Generations, TKIP Message Integrity Code , TKIP Key Mixing , WPA Encryption and Decryption , WPA Security Strength and Weaknesses.	**04**
8	**Wireless Network Security -2 :** **IEEE 802.11i/WPA2:** Key Generations 230, CCMP Encryptions and MIC 802.11i Security Strength and Weaknesses , **Bluetooth Security:** Piconets , Secure Pairings SAFER+ Block Ciphers, Bluetooth Algorithms E_1, E_{2l}, and E_{22}, Bluetooth Authentication, A PIN Cracking Attack , Bluetooth Secure Simple Pairing. **Wireless Mesh Network Security.**	**04**

Text Book:

1. Jiewang, "Network Security Theory and Practices", Springer Higher Higher Education, 2009

References:

1. William Stallings, Cryptography and Network Security Principles And Practices, 5th Edition, Pearson Publication, 2011.
2. Mark Stamp And Richard M Low, Applied Cryptanalysis, John Wiley & Sons, 2007

Course Code: 16ECSC711	Course Title: Distributed and Cloud Computing	
L-T-P: 4-0-0	Credits: 4	Contact Hrs: 4
ISA Marks: 50	ESA Marks: 50	Total Marks: 100
Teaching Hrs: 55		Exam Duration: 3 hrs
Content		**Hrs**

Chapter No. 1: Distributed System Models and Enabling Technologies Scalable Computing over the Internet, Technologies for Network-Based Systems, System Models for Distributed and Cloud Computing, Software Environments for Distributed Systems and Clouds.	6 hrs
Chapter No. 2: Virtual Machines and Virtualization of Clusters and Data Centers Implementation Levels of Virtualization, Virtualization Structures/Tools and Mechanisms, Virtualization of CPU, Memory, and I/O Devices, Virtual Clusters and Resources Management, Virtualization for Data-center Automation.	8 hrs
Chapter No. 3: Cloud Platform Architecture over Virtualized Data Centers Cloud Computing and Service Models, Architectural Design of Compute and Storage Clouds, Public Cloud Platforms.	8 hrs
Chapter No. 4: Cloud Programming and Software Environments Features of Cloud and Grid Platforms, Parallel and Distributed Programming Paradigms, Programming Support of Google App Engine, Emerging Cloud Software Environments.	10 hrs
Chapter No. 5: Cloud Resource Management and Scheduling PoliISAs and mechanisms for resource management, Applications of control theory to task scheduling on a cloud, Stability of a two-level resource allocation architecture, Feedback control based on dynamic thresholds, Coordination of specialized autonomic performance managers, A utility-based model for cloud-based web services. Resource bundling; combinatorial auctions for cloud resources, Scheduling algorithms for computing clouds. Fair queuing, Start-time fair queuing, Borrowed virtual time, Cloud scheduling subject to deadlines, Scheduling MapReduce applications subject to deadlines, Resource management and dynamic application scaling.	12 hrs
Chapter No. 6: Cloud Security	11 hrs

Cloud security risks, Security; the top concern for cloud users, Privacy; privacy impact assessment, Trust, Operating system security, Security of virtualization. Security risks posed by shared images, Security risks posed by a management OS, Xoar - breaking the monolithic design of the TCB, A trusted virtual machine monitor.	

Text Books:

1. Kai Hwang, Geoffrey C. Fox, Jack J. Dongarra, "Distributed and Cloud Computing from Parallel Processing to the Internet of Things", Morgan Kaufman, Elsevier- 2012.
2. Dan C. Marinescu "Cloud Computing Theory and Practice", Morgan Kaufman, Elsevier-2013.

Reference Books:

1. Rajkumar Buyya, Christian Vecchiola, S.Thamarai Selvi "Mastering Cloud Computing", McGraw Hill Education (India) Pvt. Limited, 2013.
2. Anthony T. Velte, Toby J. Velte, Robert Elsenpeter: Cloud Computing, A Practical Approach, McGraw Hill, 2010.

Course Code: 16ECSC712	Course Title: Computer Networks	
L-T-P: 4-0-0	Credits: 4	Contact Hrs: 4
ISA Marks: 50	ESA Marks: 50	Total Marks: 100
Teaching Hrs: 55		Exam Duration: 3 hrs

Content	Hrs
Chapter No.1 Review of Basic Concepts Basic definitions in networks, Types of Packet-Switched Networks, TCP/IP protocol Model, Performance.	5 hrs
Chapter No. 2: Data Links Layer and LAN networks Data Links, Error Detection and Correction on Links, Flow Control on Links, Link Access by Multiple, LANs and Basic Topologies, LAN Protocols, Networks of LANs, MAC/IP Address Conversion Protocols, Spanning-Tree Protocol (STP), Virtual LANs (VLANs)	10 hrs
Chapter No. 3: Network Layer Addressing Scheme in the Internet, IP Packets and Basic Routing PoliISAs, Path Selection Algorithms, Intradomain Routing Protocols, Interdomain Routing Protocols, Congestion Control at the Network Layer.	8 hrs
Chapter No. 4:Transport Layer Overview of the Transport Layer, User Datagram Protocol (UDP), Transmission Control Protocol (TCP), TCP Congestion Control	8 hrs
Chapter No.5: Network Queues and Delay Analysis Little's Theorem, Birth-and-Death Process, Queueing Disciplines, Markovian FIFO Queueing Systems, Non-Markovian and Self-Similar Models, Networks of Queues	10 hrs
Chapter No. 6. Software-Defined Networking (SDN) and Beyond Software-Defined Networking (SDN), SDN-Based Network Model, Small-Size SDN Architectures, SDN Architectures for Clouds, Network Functions Virtualization (NFV)	8 hrs

Information-Centric Networking (ICN), ICN Security..	
Chapter No. 7: Wireless Sensor Networks Sensor Networks and Protocol Structures, Communication Energy Model, Clustering Protocols, Routing Protocols,	6 hrs

Text Book:

1. Computer and Communication Networks (2nd Edition) 2nd Edition by Nader F. Mir (Author) Pearson Education 2015
2. Larry L Peterson & Bruce S Davien *Computer Networks, 5th Ed* ,Morgan Kaufmann (Elsevier), 2011

References:

1. J. F. Kurose, K. W. Ross, Computer Networking, A Top-Down Approach 6th Ed, Pearson 2012.
2. Behrouz Forouzan, Data Communications and Networking, McGraw Hill, 4th ed. 2007
3. W. Stallings, Data and Computer Communications, Pearson, Ninth Edition, 2011.

Course Code: 16ECSC713	Course Title: Software Testing	
L-T-P :3-0-0	Credits: 4	Contact Hrs: 4 hrs/week
ISA Marks: 50	ESA Marks: 50	Total Marks: 100
Teaching Hrs: 42		Exam Duration: 3 hrs

Content	**Hrs**
Chapter No. 1. Principles of Testing	3 hrs

Context of testing in producing software: About the chapter, The incomplete Car, Dijkstra's Doctrine, A test time , The cat and the saint, Test the test first, The pesticide paradox, The convoy and the rags, The police man on the bridge, The Ends of Pendulum, Men in black, Automation syndrome, Putting it all together.	
Chapter No. 2. Software Development Life Cycle Models Phases of Software Project: Requirements gathering and analysis, Planning, Design, Development or coding, Testing, Development and Maintenance, Quality, Quality assurance, and Quality Control, Testing, Verification and validation, Process model to represent different phases: Life cycle Models, Waterfall model, Prototyping and Rapid Application Development models, Spiral or Iterative model, The V model, Comparison of various life cycle models, References.	5 hrs
Chapter No. 3. Defect Testing White Box Testing: What is white box testing, Static testing, Static testing by humans, Static analysis tools: Structural testing, Unit /code fundamental testing, Code coverage testing, Code complexity testing, Black Box Testing: What is black box testing?, Why black box testing?, When to do black box testing?, How to do black box testing?, Requirement based testing, Positive and negative testing, Boundary value analysis, Decision tables, Equivalence participating , State based or graphic based testing, Compatibility testing, User documentation testing, Domain testing.	5 hrs
Chapter No. 4. Regression Testing What is regression testing?, Types of regression testing, When to do regression testing?, How to do regression testing?, Performing an initial "smoke" or "sanity" test, Understanding the criteria for selecting the test cases, Classifying the test cases, Methodology for selecting test cases, Resetting the test cases for regression testing, Concludes the results of regression testing, Best practices in regression testing.	4 hrs
Chapter No. 5. Unit Testing & Integration Testing What is integration testing?, Types of integration testing, Top-down integration, Bottom– up integration, Bi-directional integration, System integration, Choosing integration method, Integration testing as a phase of testing, Scenario testing, System scenarios, Use case scenarios, Defect bash, Choosing the frequency and duration of defect bash, Selecting right	5 hrs

product build, Communicating the object of defect bash, Setting up monitoring lab, Taking action and Fixing issues, Optimizing the effort involved in defect bash.	
Chapter No. 6. System and Acceptance Testing System Testing overview: Why is System testing done?, Functional versus Non-Functional testing, Functional system testing, Design/Architecture verification, Business vertical testing, Development testing, Beta testing, Certification, Standards and testing compliance, Non – Function testing, Setting up the configuration, Coming up with entry/exit criteria, Balancing key resources, Scalability testing, Reliability testing, Stress testing, Interoperability testing, Acceptance testing, Acceptance criteria, Selecting test cases for acceptance testing, Executing acceptance tests, Summary of testing phases, Multiphase testing model.	5 hrs
Chapter No. 7. Performance Testing Introduction, Factors governing performance testing, Methodology for performance testing, Collecting requirements, Writing test cases, Automating performance test cases, Executing performance test cases, Analyzing the performance test results, Performance tuning, Performance bench marking, Capacity planning, Tools for performance testing, Processes for performance testing, Challenges, Problems and Exercises.	5 hrs
Chapter No. 8. Test Planning, Management and Execution Introduction, Test planning, Preparing a test plan, Scope management – deciding features to be tested / not tested, Deciding test approach/strategy, Setting up criteria for testing, Identifying responsibilities, Staffing, and Training needs, Identifying resource requirements, Identifying test deliverables, Testing tasks – Size and effort estimation, Activity breakdown and scheduling, Communication management, Risk management: Test management, Choice of standards, Test infrastructure management, Test people management, Integration with product release, Test process, Putting together and base lining a test plan, Test case specifications, Update of traceability matrix, Identifying possible candidates for automation, Developing and base lining test cases. Executing test cases and keeping traceability matrix current, Collecting and analyzing matrix	5 hrs
Chapter No. 9. Reporting and Software Test Automation	5 hrs

Preparing test summary report, Recommending product release criteria: Test reporting, Recommending product release, Best practices, Process related best practices, People related best practices, Technology related best practices, What is Test automation?, Terms used in automation, Skills needed for automation, What to automate?, Scope of automation- Identifying the types of testing amenable to automation, Automating areas less prone to change, Automate tests that pertain to standards, Management aspects in automation, Design and architecture for automation.	
Text Book: 1. Desikan Srinivasan and Gopalswamy, Ramesh, Software Testing- Principles and Practices, Published by Person Education, 2nd edition, Pearson Education, 2007. ***References:*** 1. Edward Kit, Software Testing in the Real World Improving the Process, Published by Person Education, 1995. 2. Ron, Patton, Software Testing, 2nd edition Person Education, 2004. 3. Marnie, Hutcheson L., Software Testing Fundamentals, Wiley India, 2003. 4. Roger S. Pressman, Software Engineering A Practitioners Approach, 5th edition McGraw Hill.	

Course Code: 16ECSC801	Course Title: **Data Mining and Business Analytics**	
L-T-P: **4-0-0**	Credits: **4**	Contact Hrs:**4 hrs/week**
ISA Marks: 50	ESA Marks: 50	Total Marks: 100
Teaching Hrs: **50 hrs**		Exam Duration: **3 hrs**

1	**Introduction to Data Mining** Fundamentals of data mining, Data mining Functionalities, Classification of Data Mining Systems, Major issues in Data Mining, Data Warehouse and OLAP Technology for Data mining: Data Warehouse, Multidimensional Data Model, Data Warehouse Architecture.	**06 hrs**
2	**Association Rule Mining** Mining Frequent Patterns, Associations: Basic Concepts, EffiISAnt and Scalable Frequent Itemset Mining methods (Apriori Algoithm, improving effiISAncy of Apriori, Mining frequent Itemsets without Candidate generation, using vertical data formats). Mining various kinds of association rules, from association analysis to Correlation analysis.	**06hrs**
3	**Analytical Characterization & Statistical Measures:** Analytical Characterization: Analysis of Attribute Relevance, Mining Descriptive Statistical Measures in Large Databases	**04 hrs**
4.	**Classification and Prediction**	**08 hrs**

	Classification, Prediction, Classification by Decision tree Induction, Bayesian classification, Associative classification, Prediction: Linear Regression, non-linear regression.	
5	**Cluster Analysis** Types of data in cluster analysis, Categorization of major clustering methods, Classical Partitioning methods : k-Means and k-Medoids.	**08 hrs**
6	**Graph Mining & Social Network Analysis** Graph mining: Methods for Mining Frequent Subgraphs, Mining Variant and Constrained substructure patterns, Social Network Analysis: Social networks, Characteristics of Social Networks,Link Mining, Mining on Social networks	**08 hrs**
7	**Business Analytical Modeling** Analytical Modeling by Factor and Cluster Analysis, Analytical Modeling by Logistics Regression and Discriminant Analysis.	**05 hrs**
8	**Segmentation of Target Market** Segmentation of primary target market by Heuristic Modeling such as RFM (Recency, Frequency, Monetary) analysis, Segmentation of target market based on large databases using Decision Tree approaches such as CHAID (Chi-square Automatic Interaction Detection) and other Classification and Regression Trees.	**05hrs**

Text Book

1. Jiawei Han and MichelineKamber, Data Mining: Concepts and Techniques, Second Edition, Elsevier.
2. Purba Halady Rao, Business Analytics: An Application Focus, PHI, New Delhi, 2013.

References

1. Michael Berry and Gordon Linoff, *Data Mining Techniques*,Wiley Publishing, 2004.
2. Kimball and Ross, The Data Warehouse Toolkit, Second Edition, John Wiley & Sons, 2002.
3. T. Davenport, "Competing on Analytics," Harvard Business Review (Decision Making), January 2006.

Course Code: 16ECSC801	Course Title: **Data Mining and Business Analytics**	
L-T-P: **4-0-0**	Credits: **4**	Contact Hrs:**4 hrs/week**
ISA Marks: 50	ESA Marks: 50	Total Marks: 100
Teaching Hrs: **50 hrs**		Exam Duration: **3 hrs**

1	**Introduction to Data Mining** Fundamentals of data mining, Data mining Functionalities, Classification of Data Mining Systems, Major issues in Data Mining, Data Warehouse and OLAP Technology for Data mining: Data Warehouse, Multidimensional Data Model, Data Warehouse Architecture.	**06 hrs**
2	**Association Rule Mining** Mining Frequent Patterns, Associations: Basic Concepts, EffiISAnt and Scalable Frequent Itemset Mining methods (Apriori Algoithm, improving effiISAncy of Apriori, Mining frequent Itemsets without Candidate generation, using vertical data formats). Mining various kinds of association rules, from association analysis to Correlation analysis.	**06hrs**
3	**Analytical Characterization & Statistical Measures:** Analytical Characterization: Analysis of Attribute Relevance, Mining Descriptive Statistical Measures in Large Databases	**04 hrs**
4.	**Classification and Prediction**	**08 hrs**

	Classification, Prediction, Classification by Decision tree Induction, Bayesian classification, Associative classification, Prediction: Linear Regression, non-linear regression.	
5	**Cluster Analysis** Types of data in cluster analysis, Categorization of major clustering methods, Classical Partitioning methods : k-Means and k-Medoids.	**08 hrs**
6	**Graph Mining & Social Network Analysis** Graph mining: Methods for Mining Frequent Subgraphs, Mining Variant and Constrained substructure patterns, Social Network Analysis: Social networks, Characteristics of Social Networks,Link Mining, Mining on Social networks	**08 hrs**
7	**Business Analytical Modeling** Analytical Modeling by Factor and Cluster Analysis, Analytical Modeling by Logistics Regression and Discriminant Analysis.	**05 hrs**
8	**Segmentation of Target Market** Segmentation of primary target market by Heuristic Modeling such as RFM (Recency, Frequency, Monetary) analysis, Segmentation of target market based on large databases using Decision Tree approaches such as CHAID (Chi-square Automatic Interaction Detection) and other Classification and Regression Trees.	**05hrs**

Text Book

3. Jiawei Han and MichelineKamber, Data Mining: Concepts and Techniques, Second Edition, Elsevier.
4. Purba Halady Rao, Business Analytics: An Application Focus, PHI, New Delhi, 2013.

References

4. Michael Berry and Gordon Linoff, *Data Mining Techniques*,Wiley Publishing, 2004.
5. Kimball and Ross, The Data Warehouse Toolkit, Second Edition, John Wiley & Sons, 2002.
6. T. Davenport, "Competing on Analytics," Harvard Business Review (Decision Making), January 2006.

Course Content

Course Code: 17ECSE706 **Course Title: Embedded Systems.**

Teaching Hours: 42 hours **ESA: 50 marks** **ISA: 50 marks** **L-T-P: 3-0-1**

Unit–I	
Chapter 1: The 8051 Architecture Introduction, 8051 Microcontroller hardware, input/output pins, ports & circuits, External memory.	**6 hours**
Chapter 2: Addressing modes & operations Introduction, addressing modes, external data Moves. Code Memory Read Only Data Moves / Indexed Addressing mode, PUSH and POP opcodes, Data exchanges, example programs. Byte level logical Operations, Bit level Logical Operations, Rotate and Swap Operations, Example Programs. Arithmetic Operations: Flags, Incrementing and Decrementing, Addition, Subtraction, Multiplication and Division, Decimal Arithmetic, Example Programs.	**7 hours**
Chapter 3: Jump and Call Instructions The JUMP and CALL Program range, jump calls and Subroutines, Example programs	**4 hours**
Unit–II	
Chapter 4: 8051 Programming in C Data Types and Time delays in 8051C, I/O Programming, Logic operations, Data Conversion programs, Data serialization.	**4 hours**

Chapter 5: 8051 Timer/Counter Programming in Assembly and C Programming 8051 Timers, Counter Programming, Programming Timer 0 and Timer1 in 8051.	**4 hours**
Chapter 6: 8051 Serial Port Programming in Assembly and C Basics of Serial Communication, 8051 connection to RS232, 8051 serial port Programming in Assembly, 8051 serial port Programming in C.	**4 hours**
Chapter 7: 8051 Interrupts Programming in Assembly and C 8051 Interrupts, Programming Timer Interrupts, Programming external hardware interrupts, Programming the Serial Communication Interrupts, Interrupt Priority in the 8051, Interrupt programming in assembly and C.	**5 hours**
Unit–III	
Chapter 8: 8051 Interfacing techniques Interfacing 8051 to LEDs, DIP switches, BCD Decoder display, 7 Segment Display, Timers hyperterminal (Serial Communication)	**4 hours**
Chapter 9: 8051 Interfacing to peripheral devices Interfacing 8051 to LCD, Keypad, DAC, parallel and serial ADC, Stepper Motor and DC Motor.	**4 hours**
Embedded Systems Lab: Experiments on all the above mentioned chapters to be conducted.	

Text Books

1. Ayala.K.J, “The 8051 Microcontroller Architecture, Programming & Applications”, 2ed., Penram International, 2006
2. Mazidi.M.A, Mazidi.J.G and McKinlay.R.D, “The 8051 Microcontroller and Embedded Systems-using Assembly and C”, 2ed, PHI 2006/Pearson, 2006

Reference

1. Hall.D.V, “Microprocessors and Interfacing”, Revised 2ed., TMH,2006

MOBILE APPLICATION DEVELOPMENT SEMESTER – III			
Subject Code	17ECSE803	ISA Marks	50
Number of Lecture Hours/Week	03	ESAMarks	50
Total Number of Lecture Hours	42hrs + 2hr/week Lab	Exam Hours	03
CREDITS – 3-0-1			

Course objectives: This course will enable students to

- Analyze system requirements for mobile applications.
- Apply of mobile development frameworks.
- Demonstrate mobile application design.
- Demonstrate and implement mobile application.

Module -1	**Teaching Hours**
Introduction to mobile communication and computing: Introduction to mobile computing, Novel applications, limitations and GSM architecture, Mobile services, System architecture, Radio interface, protocols, Handover and security. Smart phone operating systems and smart phones applications.	**8 Hours**
Module -2	
Fundamentals of Android Development: Introduction to Android., The Android 4.1 Jelly Bean SDK, Understanding the Android Software Stack, Installing the Android SDK, Creating Android Virtual Devices, Creating the First Android Project, Using the Text View Control, Using the Android Emulator.	**8 Hours**
Module – 3	
The Intent of Android Development, Four kinds of Android Components: Activity, Service, Broadcast Receiver and Content Provider. Building Blocks for Android Application Design, Laying Out Controls in Containers. Graphics and Animation: Drawing graphics in Android, Creating Animation with Android's Graphics API.	**8 Hours**
Module-4	
Creating the Activity, Working with views: Exploring common views, using a list view, creating custom views, understanding layout. Using Selection Widgets and Debugging Displaying and Fetching Information Using Dialogs and Fragments. Multimedia: Playing Audio, Playing Video and Capturing Media. Advanced Android Programming: Internet, Entertainment, and Services.	**9 Hours**
Module-5	
Displaying web pages and maps, communicating with SMS and emails,. Creating and using content providers: Creating and consuming services, publishing android applications	**9 Hours**

Course outcomes:
The students should be able to: • Describe the requirements for mobile applications • Explain the challenges in mobile application design and development • Develop design for mobile applications for specific requirements • Implement the design using Android SDK • Implement the design using Objective C and iOS • Deploy mobile applications in Android and iPone marketplace for distribution
Mobile Application Lab: To develop Simple t o Complex Mobile Applications
Text Books: 1. Mobile Computing: (technologies and Applications-N. N. Jani S chand 2. B.M.Hirwani- Android programming Pearson publications-2013 3. W. Frank Ableson, Robi Sen and C. E. Ortiz - **Android in Action**, Third Edition-2012 DreamTech Publisher

MOBILE APPLICATION DEVELOPMENT SEMESTER – III			
Subject Code	17ECSE803	ISA Marks	50
Number of Lecture Hours/Week	03	ESAMarks	50
Total Number of Lecture Hours	42hrs + 2hr/week Lab	Exam Hours	03
CREDITS – 3-0-1			

Course objectives: This course will enable students to

- Analyze system requirements for mobile applications.
- Apply of mobile development frameworks.
- Demonstrate mobile application design.
- Demonstrate and implement mobile application.

Module -1	**Teaching Hours**
Introduction to mobile communication and computing: Introduction to mobile computing, Novel applications, limitations and GSM architecture, Mobile services, System architecture, Radio interface, protocols, Handover and security. Smart phone operating systems and smart phones applications.	**8 Hours**
Module -2	
Fundamentals of Android Development: Introduction to Android., The Android 4.1 Jelly Bean SDK, Understanding the Android Software Stack, Installing the Android SDK, Creating Android Virtual Devices, Creating the First Android Project, Using the Text View Control, Using the Android Emulator.	**8 Hours**
Module – 3	
The Intent of Android Development, Four kinds of Android Components: Activity, Service, Broadcast Receiver and Content Provider. Building Blocks for Android Application Design, Laying Out Controls in Containers. Graphics and Animation: Drawing graphics in Android, Creating Animation with Android's Graphics API.	**8 Hours**
Module-4	
Creating the Activity, Working with views: Exploring common views, using a list view, creating custom views, understanding layout. Using Selection Widgets and Debugging Displaying and Fetching Information Using Dialogs and Fragments. Multimedia: Playing Audio, Playing Video and Capturing Media. Advanced Android Programming: Internet, Entertainment, and Services.	**9 Hours**
Module-5	
Displaying web pages and maps, communicating with SMS and emails,. Creating and using content providers: Creating and consuming services, publishing android applications	**9 Hours**

Course outcomes:
The students should be able to: • Describe the requirements for mobile applications • Explain the challenges in mobile application design and development • Develop design for mobile applications for specific requirements • Implement the design using Android SDK • Implement the design using Objective C and iOS • Deploy mobile applications in Android and iPone marketplace for distribution
Mobile Application Lab: To develop Simple t o Complex Mobile Applications
Text Books: 4. Mobile Computing: (technologies and Applications-N. N. Jani S chand 5. B.M.Hirwani- Android programming Pearson publications-2013 6. W. Frank Ableson, Robi Sen and C. E. Ortiz - **Android in Action**, Third Edition-2012 DreamTech Publisher

Program: Master of Technology		
Course Title: **Applied Mathematics**		Course Code: **18ECSC701**
L-T-P:**3-0-1**	Credits: **3**	Contact Hrs: **3 hrs/week**
ISA Marks: **50**	ESA Marks: **50**	Total Marks: **100**
Teaching Hrs:**42**	Exam Duration: **3 hrs**	

1	**Introduction to Statistics** Statistical Thinking, Collecting data, Statistical Modeling Framework, Measure of Central Tendency and Variance, Importance of Data symmetry and Display, Graphical and Tabular Display.	**04 hrs**
2	**Discrete Random Variables and Probability Distribution** Discrete Random variables, Probability distributions and Probability mass function, Cumulative distribution function, Mean and Variance of a discrete random variable, Discrete Uniform distribution, Binomial distribution, Geometric distribution, Poisson distribution, Applications.	**07 hrs**
3	**Continuous Random Variables and Probability Distributions** Continuous random variables, Probability distributions and probability density functions, cumulative distribution functions, Mean and Variance of a continuous random variable, Uniform distribution, Normal Distribution, Normal approximation to Binomial and Poisson distribution, Exponential distribution.	**07hrs**
4	**Testing of Hypothesis** Estimation theory, Hypothesis testing, Inference on the mean of population (variance known and unknown) Inference on the variance of a normal population, Inference on a population proportion, Testing for Goodness of fit, Inference for a difference in Means(variances known), Inference for a difference in means of two normal distributions (variances unknown), Inference on the Variances of two normal populations, Inference on two population proportions.	**08hrs**

5	**Simple Linear Regression and Correlation** Simple Linear Regression, Properties of Least square Estimators and Estimation of Variances, Transformations to a Straight line, Correlation, Multiple linear regression model, Least square Estimation of parameters, Matrix approach to multiple linear regression, Properties of least square estimators and estimation of variance.	**06 hrs**
6	**Queuing Theory 1 :** Basics of queuing models, Model I (M /M/ 1): (∞/FIFO), Single Server with Infinite Capacity, Model II (M/M/s): (∞/FIFO), Multiple Server with Infinite Capacity	**05 hrs**
7	**Queuing Theory 2:** Model III (M/M/1): (k/FIFO), Single Server with Finite Capacity, Model IV (M/M/s): (k/FIFO), Multiple Server with Finite Capacity.	**05 hrs**

References:

1. Douglas C Montgomery, George C Runger, Applied Statistics for Engineers, 2nd Edition,John Wiley and Sons, ISBN-0-471-170027-5.
2. Richard I Levin, David S Rubin, Statistics for Management, 6th Edition, Prentice Hall India.
3. Willian W Hines, Douglas C Montgomery, Probability and Statistics in Engineering, 2nd Edition, John Wiley and Sons.
4. V. Sundarapandian, Probability, Statistics and Queuing theory, PHI, 2009.
5. Arnold Oral Allen, Probability, statistics, and queuing theory: with computer science applications, Gulf Professional Publishing, Edition: 2 ,28-Aug-1990

Course Content

Course Code: **18ECSC702**	Course Title: **Internet Of Things**	
L-T-P: **3-0-1**	Credits: **4**	Contact Hrs: **42**
ISA Marks: **50**	ESA Marks: **50**	Total Marks: **100**
Teaching Hrs: **42**		Exam Duration: **3 hrs**

Content	Hrs
Chapter No 1. Introduction to Internet of Things (IoT): Definition & Characteristics of IoT, Physical Design of IoT: IoT protocols, Logical Design of IoT: IoT functional blocks, communication models and APIs.	**4**
Chapter No 2. IoT Enabling Technologies: Wireless Sensor Networks, Cloud Computing, Big Data Analytics, Communication Protocols, Embedded Systems, IoT Levels and Deployment Templates.	**6**
Chapter No 3. Domain specific IoTs: Home Automation, Cities, Environment, Energy, Retail, Logistics, Agriculture, Industry, Health and Lifestyle.	**6**
Chapter No 4. IoT Platforms Design Methodology: IoT Design Methodology, Case Study on IoT System for Weather Monitoring.	**4**
Chapter No 5. IoT systems – Logical design using Python: Introduction to Python, Data types, data structures, Control of flow, functions modules, packages, file handling, data/time operations, classes, Python packages - JSON, XML, HTTPLib, URLLib, SMTPLib.	**6**
Chapter No 6. IoT Physical Devices and Endpoints: Basic building blocks of an IoT device, Exemplary device: Rasyberry Pi, interface (serial, SPI, I2C), Programming Rasyberry Pi with Python.	**6**
Chapter No 7. IoT Physical Servers & Cloud Offerings:	**5**

Introduction to Cloud Storage models and communication APIs ,Webserver – Web server for IoT, Cloud for IoT, Python web application framework, Designing a RESTful web API	
Chapter No 8. Case Studies Illustrating IoT Design: Home Automation-smart lighting, home intrusion detection, Cities-smart parking.	**5**

Text Books :

1. Internet of Things - A Hands-on Approach, Arshdeep Bahga and Vijay Madisetti, Universities Press, 2015, ISBN: 9788173719547

References:

1. Getting Started with Raspberry Pi, Matt Richardson & Shawn Wallace, O'Reilly (SPD), 2014, ISBN: 9789350239759

Course Content

Course Code: 18ECSC704	Course Title: Computer Networks	
L-T-P-Self Study: 3-0-1	Credits: 4	Contact Hrs: 42
ISA Marks: 50	ESA Marks: 50	Total Marks: 100
Teaching Hrs: 42		Exam Duration: 3 hrs

Content	Hrs
Chapter No. 1 Fundamental Concepts of computer Networks Basic Definitions in Data Networks, Applications, Requirements, Network Architecture, Packet Size and Optimizations, Performance.	4 hrs
Chapter No. 2 Data Links Layer Perspectives on Connecting, Encoding (NRZ, NRZI,Manchester, 4B/5B), Framing, Error Detection, Reliable Transmission, Ethernet and Multiple Access Networks.	8 hrs
Chapter No. 3 Network Layer : Data plane Overview of Network Layer, Router Architecture, The Internet Protocol (IP): IPv4, Addressing, IPv6, Generalized Forwarding and SDN.	8 hrs
Chapter No. 4 Network Layer : Control plane Introduction, Routing Algorithms, Intra-AS Routing in the Internet: OSPF, Routing Among the ISPs: BGP, The SDN Control Plane, ICMP: The Internet Control Message Protocol, Multicast, Multiprotocol Label Switching (MPLS).	8 hrs
Chapter No. 5Transport layer Introduction and Transport-Layer Services, Multiplexing and De-multiplexing, connectionless Transport: UDP, Connection-Oriented Transport: TCP, Principles of Congestion Control, TCP Congestion Control.	8 hrs

Chapter No. 6Application Layer Principles of Network Applications, The Web and HTTP, Electronic Mail in the Internet, DNS—The Internet's Directory Service, Peer-to-Peer Applications, Video Streaming and Content Distribution Networks.	6 hrs

Text Books (List of books as mentioned in the approved syllabus)

1. J. F. Kurose and K. W. Ross, “Computer Networking, A Top-Down Approach”, 7th Ed, , Pearson , 2017
2. Larry L Peterson & Bruce S Davien, “Computer Networks A System Approach”, 5th Ed , Morgan Kaufmann (Elsevier),, 2011

References

1. Nader F. Mir, Computer and Communication Networks, 2nd Edition, Pearson Prentice-Hall, 2015
BehrouzForouzan, Data Communications and Networking, 5th Ed, McGraw Hill, 2012.
2. A S Tanenbaum, D J Wetherall, Computer Networks, 5th Ed., Prentice-Hall, 2010.
3.

Course Content

Course Code: **18ECSCP709**	Course Title: **Design and Analysis of Algorithms**	
L-T-P: 2-0-2	Credits: 4	Contact Hrs: 4hrs/week
CIA Marks: 50	SEE Marks: 50	Total Marks: 100
Teaching Hrs: 42		Exam Duration: 3 hrs

Content	Hrs
Chapter No. 1: Introduction Analysis Framework, Asymptotic Notations and Basic Efficiency Classes, Mathematical Analysis of Non-Recursive Algorithms and Mathematical Analysis of Recursive Algorithms.	6
Chapter 2: Hashing Technique Direct Address Table, Hash Table, Hash Function and Collision Resolution Techniques.	6
Chapter No. 3: Algorithm design techniques: **Divide and conquer:** General Method, Merge sort, quick sort, Matrix Computations **Greedy Technique:** General Method, Huffmann Coding, knapsack problem, Task Scheduling and minimum spanning tree. **Dynamic Programming:** General Method, Floyd-Warshall algorithm, String Editing, Longest Common Subsequence and shortest paths	15
Chapter No. 4: Combinatorial Problem solving Techniques: **Backtracking Method**: General Method, Sum of subsets, knapsack Problem and Game strategies **Branch and Bound method:** General Method, knapsack Problem,	15

Approximation algorithms and Randomized algorithms. **NP- Hard and NP Complete:** Examples, proof of NP-hardness and NP-completeness.	

Reference Books:

1. Introduction to Design and Analysis of Algorithms – Anany Levitin 3rd Edition, Pearson, 2012
2. T.H.Cormen, C.E.Leiserson, R.L.Rivest, C. Stein, Introduction to Algorithms, 3nd edition, MIT, 2009.
3. Michael T. Goodrich, Roberto Tamassia, Algorithm Design and Applications, Wiley Publications, 2015

Course Content

Course Code: **18ECSC710**	Course Title: **Distributed and Cloud Computing**	
L-T-P : 2-0-1	Credits: 3	Contact Hrs: 4 hrs./week
ISA Marks: 50	ESA Marks: 50	Total Marks: 100
Teaching Hrs: 42		Exam Duration: 3hrs

Content	Hrs
Chapter No. 1. Distributed System Models and Enabling Technologies Scalable Computing over the Internet, Technologies for Network-Based Systems, System Models for Distributed and Cloud Computing	04 hrs
Chapter No. 2. Virtual Machines and Virtualization of Clusters Implementation Levels of Virtualization, Virtualization Structures/Tools and Mechanisms, Virtualization of CPU, Memory, and I/O Devices, Virtual Clusters and Resources Management.	06 hrs

Chapter No. 3. Cloud Platform Architecture over Virtualized Data Centers Cloud Computing and Service Models, Architectural Design of Compute and Storage Clouds, Public Cloud Platforms.	06 hrs
Chapter No. 4. Cloud Programming and Software Environments Challenges and Opportunities in cloud application, architectural styles, workflows: co-ordination of multiple activities, MapReduce programming model.	06 hrs
Chapter No. 5. Cloud Resource Management Policies and mechanisms for resource management, Applications of control theory to task scheduling on a cloud, Stability of a two-level resource allocation architecture, Feedback control based on dynamic thresholds, Coordination of specialized autonomic performance managers.	08 hrs
Chapter No. 6. Cloud Resource Scheduling Resource bundling; combinatorial auctions for cloud resources, Scheduling algorithms for computing clouds. Fair queuing, Start-time fair queuing, Borrowed virtual time, Cloud scheduling subject to deadlines, Scheduling Map Reduce applications subject to deadlines.	06 hrs
Chapter No. 7. Cloud Security Cloud security risks, Security; the top concern for cloud users, Privacy; privacy impact assessment, Trust, Operating system security, Security of virtualization, Security risks posed by shared images, Security risks posed by a management OS, Xoar - breaking the monolithic design of the TCB, A trusted virtual machine monitor.	06 hrs

Text Book (List of books as mentioned in the approved syllabus)

1. Kai Hwang, Geoffrey C. Fox, Jack J. Dongarra, Distributed and Cloud Computing from Parallel Processing to the Internet of Things, 1, Elsevier, 2012
2. Dan C. Marinescu , Cloud Computing Theory and Practice, 1, Elsevier, 2013

References

1. RajkumarBuyya, Christian Vecchiola, S.ThamaraiSelvi , Mastering Cloud Computing, 1, McGraw Hil, 2013
2. Anthony T. Velte, Toby J. Velte, Robert Elsenpeter, Cloud Computing, A Practical Approach, 1, McGraw Hil, 2010

Program: Master of Technology		
Course Title: **Software Engineering**		Course Code: **18ECSC712**
L-T-P: **2-0-1**	Credits: **3**	Contact Hrs: **3 hrs/week**
ISA Marks: **50**	ESA Marks: **50**	Total Marks: **100**
Teaching Hrs: **42**	Exam Duration: **3 hrs**	

1	**Introduction to Software Engineering** Introduction to Software Engineering and A Generic view of process	**04 hrs**
2	**Process Models** Prescriptive Models, The waterfall model, Incremental process models, Evolutionary process models, Specialized process models, The Unified process. Agile view of process.	**06 hrs**
3	**Requirements engineering :**Requirements Engineering tasks, Initiating Requirements Engineering Process Eliciting Requirements, Elicitation Work Products ,Developing Use-Cases , Analysis Model, Negotiating Requirements and Validating requirements.	**05 hrs**
4	**Design Engineering** Design within the context of SE, Design process and design quality, Design concepts, The design Model, Pattern based software design, Architectural design: Software Architecture, Data design, Architectural styles and patterns, Architectural design,	**04 hrs**
5	**Overview of object-oriented concepts**	**06 hrs**

	Unified Modeling Language (UML). Class Model, State Model and Interaction Models: Use case, sequence and activity diagrams.	
6	**Object Oriented System Design** Reuse Plan, Breaking a system into sub-systems and organizing. Allocation of sub-systems to hardware and software. High Level Class Design: Design Optimization, Adjustment of Inheritance and Organizing a class design.	**07 hrs**
7	**Testing Strategies:** A strategic approach to software testing, Test strategies for conventional software, validation testing, system testing. Testing tactics: White box testing, basis path testing, control structure testing, black box testing, testing for specialized environments, architectures and applications.	**05 hrs**
8	**Project Management and Metrics:** Management spectrum, The people, product, process , metrics in the process and project domains, soft ware measurements, metrics for software quality. Project Estimation: Observations on estimation, the project planning process , software scope and feasibility , resources, software project estimation, Decomposition techniques, empirical estimation models	**05 hrs**

References:

1. Roger S Pressman, Software Engineering A practitioner Approach, Seventh Edition, McGrawHill International Edition, 2009
2. Blaha M, Rumbaugh, Object Oriented Modeling and Design with UML, Second, Pearson, 2008
3. Ian Sommerville, Software Engineering, Seventh Edition, Pearson education, 2004.
4. Ali Bahrami, Object Oriented System Development using U M Languages, Mc-Grawhill, 2008

Course Content

Course Code: **18ECSC713**	Course Title: **Image and Video Processing**	
L-T-P : 2-0-1	Credits: 3	Contact Hrs: : **4 hrs/week**
ISA Marks: 50	ESA Marks: 50	Total Marks: 100
Teaching Hrs: 42		Exam Duration: 03

Content	Hrs
1. Fundamentals of Image processing and Image Transforms: Basic steps of Image processing system sampling and quantization of an Image – Basic relationship between pixels. Image Transforms: 2 D Discrete Fourier Transform, Discrete Cosine Transform (DCT), Discrete Wavelet transforms.	07
2. Image Enhancement: Spatial Domain methods: Histogram Processing, Fundamentals of Spatial Filtering, Smoothing Spatial filters, Sharpening Spatial filters. Frequency Domain methods: Basics of filtering in frequency domain, image smoothing, image sharpening, selective filtering.	08
3. Image Analysis: Spatial feature extraction, Transform features, Edge detection Boundary Extraction, Boundary representation, Region representation, Moment representation, Structure, Shape features, Texture, Scene matching & detection, Image segmentation and Classification Techniques.	**08**
4.Basics of Video Processing: Analog video, Digital Video, Time varying Image Formation models : 3D motion models, Geometric Image formation, Photometric Image formation, sampling of video signals, filtering operations	**07**

5. 2D Motion Estimation: Optical flow, pixel based motion estimation, Block matching algorithm, Mesh based motion Estimation, global Motion Estimation, Region based motion estimation, multi resolution motion estimation.	**06**
6. Video Segmentation and Tracking : Change detection, Spatiotemporal change detection, Motion segmentation, Motion tracking in video : Rigid object tracking and articulated object tracking	**06**

Text Books

1. R. C. Gonzalez and R. E. Woods, "Digital Image Processing," 3rd edition, Pearson Education(Asia) Pte. Ltd/Prentice Hall of India, 2009.
2. M. Tekalp, "Digital Video Processing", 2nd edition, Prentice Hall, USA, 2015.

References

1. Anil K. Jain, "Fundamentals of Digital Image Processing," Pearson Education (Asia) Pte. Ltd./Prentice Hall of India, 2004.
2. Alan C Bovik " Essential Guide to Video Processing", AP Elsevier publication, 2009
3. Z. Li and M.S. Drew, "Fundamentals of Multimedia," Pearson Education (Asia) Pte. Ltd 2004.

Course Content

Course Code: 18ECSC711	Course Title: Machine Learning	
L-T-P : 2-0-1	Credits: 3	Contact Hrs: 3 per week
ISA Marks: 50	ESA Marks: 50	Total Marks: 100
Teaching Hrs: 42		Exam Duration: 3 Hrs

Content	Hrs
Chapter- 1: Introduction & Data Pre-Preprocessing Introduction to data mining, Introduction to Machine Learning, Applications of Machine Learning, Major tasks in data preprocessing - data reduction, data transformation and data Discretization, data cleaning and data integration.	8
Chapter - 2: **Mining Frequent Patterns, Associations and Correlations: Concepts and Methods** Basic Concepts, Efficient and Scalable Frequent Item set Mining Methods, finding interesting Patterns, Pattern Evaluation Methods, Applications of frequent pattern and associations, Advanced Frequent Pattern Mining- Frequent Pattern and Association Mining: A Road Map, Mining Various Kinds of Association Rules. Pattern Mining in Multilevel, Multidimensional Space.	7
Chapter- 3: Supervised Learning: Classification Model Evaluation and Selection, Techniques to Improve Classification Accuracy: ensemble Methods; Bayesian belief networks, Introduction to perceptron learning, Back propagation algorithm.	8
Chapter- 4: Unsupervised Learning: Cluster Analysis Partitioning methods, Hierarchical Methods, Density based methods, Outlier Detection.	7
Chapter- 5: Regression Analysis ANOVA, Linear Discriminant Analysis, Support Vector Machines	6

Chapter- 6: Reinforcement Learning Introduction to Reinforcement Learning (RL), Sequential Decision Problems, Passive RL, Active RL, Generalization in RL, Applications of RL.	6

Text Books (List of books as mentioned in the approved syllabus)

1. Jiawei Han, MichelineKamber, and Jian Pei, Data Mining: Concepts and Techniques, 3rd, Morgan Kaufmann, 2011
2. Pang-Ning, Michael Steinbach, Vipin Kumar, Introduction to Data Mining, Pearson Education, 2007

References

1. Ian H. Witten, Eibe Frank, Mark A. Hall, Data Mining - Practical Machine Learning Tools and Techniques, 3rd, Elsevier Inc, 2011
2. M. H. Dunham, “Data Mining: Introductory and Advanced Topics”, Pearson Education. 2008.