School of Computer Science and Engineering

Course Code: **15ECSC702**	Course Title: **Software Engineering**	
L-T-P: **4-0-0**	Credits: 4	Contact Hrs:**4 hrs/week**
CIE Marks: **50**	SEE Marks: **50**	Total Marks: **100**
Teaching Hrs: **55 hrs**		Exam Duration: **3 hrs**

1	Introduction : 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.	**09 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.	**09 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,	**07 hrs**
5	Testing Strategies: A strategic approach to software testing, Test strategies for conventional software, validation testing, system testing.	**07 hrs**
6	Testing tactics: White box testing, basis path testing, control structure testing, black box testing, testing for specialized environments, architectures and applications.	**08 hrs**
7	Project Management and Metrics : Management spectrum, The people, product, process , metrics in the process and project domains, soft ware measurements, metrics for software quality.	**05 hrs**
8	Project Estimation: Observations on estimation, the project planning process , software scope and feasibility , resources, software project estimation, Decomposition techniques, empirical estimation models	**06 hrs**

Text book:

1. Software Engineering :A practitioner's Approach, Roger S Pressman, seventh edition. McGrawHill International Edition, 2009.

Reference books:

1. Software Engineering, Ian Sommerville, seventh edition, Pearson education,2004.
2. Software Project Management, Bob Hughes & Mike Cotterell, fourth edition,Tata McGraw Hill,2006
3. Software Engineering – Architecture Driven Software Development, RICHARD F. SCHMIDT, Elsevier Publications

Course Code: **15ECSC703**	Course Title: **Database Management System**	
L-T-P: **4-0-0**	Credits: 4	Contact Hrs:**4 hrs/week**
CIE Marks: **50**	SEE Marks: **50**	Total Marks: **100**
Teaching Hrs: **55 hrs**		Exam Duration: **3 hrs**

1	**Introduction to DBMS and Data Modeling Using the ER Model:** Introduction: Data models, schemas and instances, Three-schema architecture and data independence. Data Modeling: An Example Database Application, Entity Types, Entity Sets, Attributes and Keys, Relationship types, Relationship Sets, Roles and Structural Constraints, Weak Entity Types, Refining the ER Design, ER Diagrams, Naming Conventions and Design Issues.	**09 Hrs**
2	**Relational Data Model and Relational Database Constraints:** Relational model constraints and relational database schema; Update operations, transactions and dealing with constraint violations.	**06 Hrs**
3	**Database Design:** Database Design Using ER- to-Relational Mapping**,** Informal Design Guidelines for Relation Schemas; Functional Dependencies; Normal Forms Based on Primary Keys; General Definitions of Second and Third Normal Forms; Boyce-Codd Normal Form.	**06 Hrs**
4	**Query Processing** Translating SQL queries to Relational Algebra, Algorithms for External sorting, Algorithms for SELECT, JOIN, PROJECT and SET operations. Implementing Aggregate and OUTER JOINS, Overview of Query optimization	**08 Hrs**
5	**Transaction Management:** The ACID Properties; Transactions and Schedules; Concurrent Execution of Transactions; Lock-Based Concurrency Control; Performance of locking; Transaction support in SQL; Introduction to crash recovery; 2PL, Serializability and Recoverability; Lock Management; Introduction to ARIES; The log; Other recovery-related structures; The write-ahead log protocol; Check pointing; Recovering from System Crash; Media Recovery; Other approaches and interaction with concurrency control	**10 Hrs**
6	**Database Security** Introduction to Database security, Discretionary Access control based on granting and revoking privileges, Mandatory access control and role based access control for multilevel security, Introduction to statistical database security, Introduction to flow control, Encryption and public key infrastructures, Challenges in database security	**08 Hrs**
7	**Object and Object-Relational Databases:** Overview of Object-Oriented Concepts, Object Identity, Object Structure and Type Constructors, Encapsulation of operations, Methods and persistence, Type and class hierarchies	**08 Hrs**

	and inheritance, Object model of ODMG, Object definition Language ODL, Object Query Language OQL, Conceptual design of Object database.	

Text Book

1. Elmasri and Navathe: Fundamentals of Database Systems, 5th Edition, Pearson Education,2008.

References

1. Raghu Ramakrishnan and Johannes Gehrke: Database Management Systems, 3rd Edition, McGraw-Hill, 2003.
2. Abraham Silberschatz, Henry F. Korth, S. Sudarshan: Database System Concepts, 4th Edition, McGraw Hill, 2002.

School of Computer Science and Engineering

_Course Code: 15ECSC704	Course Title: **Operating Systems**	
L-T-P: **4-0-0**	Credits: **4**	Contact Hrs:**4 hrs/week**
CIE Marks: **50**	SEE Marks: **50**	Total Marks: **100**
Teaching Hrs: **55 hrs**		Exam Duration: **3 hrs**

1	Operating System Overview Operating System objectives and functions, Evolution of OS, Major achievements, Developments leading to modern OS, Overview of Microsoft Windows and Linux	**06 Hrs**
2	Processes and Threads Processes- Definition, States, Description, Control, Security issues, Threads, Symmetric multiprocessing, Microkernel, Process and thread management in Windows & Linux	**08 Hrs**
3	Concurrency Principles of concurrency, Mutual exclusion, Semaphores, Monitors, Message passing, Readers problem, Deadlock- Prevention, Avoidance and Detection; Integrated deadlock strategy, Dining philosophers problem, Concurrency mechanism in Windows & Linux	**08 Hrs**
4	Memory Management and Virtual Memory Memory management- Requirements, Partitioning, Paging, Segmentation, Security issues Virtual memory - Hardware and control structures, Operating System software Memory management in Windows & Linux	**08 Hrs**
5	Scheduling Uniprocessor scheduling- Types of processor scheduling, Scheduling algorithms, Multiprocessor scheduling, Real time scheduling, Scheduling in Windows & Linux	**06 Hrs**
6	Design Techniques with Examples Design considerations, Monolithic kernels, Modular organization, Extensible nucleus, Layered Organizations, Operating Systems for distributed systems	**08 Hrs**
7	File Management Overview, Organization, Directories, Sharing, Record blocking, File system security	**06 Hrs**
8	RTOS Characteristics, Case study- TinyOS, eCOS	**05 Hrs**

Text Book

1. Text Book: William Stallings: Operating Systems- Internals and Design Principles, 6th Edition, Prentice Hall, 2008.
2. Gary Nutt, Nabendu Chaki, Sarmistha Neogy: Operating Systems, 3rd Edition, Pearson Education, 2004

References:

1. Abraham Silberschatz, Galvin, Gagne: Operating System Concepts, 8th Edition, Wiley, 2008.
2. Andrew S. Tanenbaum, Albert S. Woodhull: Operating Systems, Design and Implementation, 3rd Edition, Prentice Hall, 2006.
3. Charles Crowley: Operating System, design oriented approach, 2004.

School of Computer Science and Engineering

Course Code: **15ECSE707**	Course Title: **Web Technology**	
L-T-P: **3-1-0**	Credits: **4**	Contact Hrs:**5 hrs/week**
CIE Marks: **50**	SEE Marks: **50**	Total Marks: **100**
Teaching Hrs: **42 hrs**		Exam Duration: **3 hrs**

1	Introduction to Web Technology: Introduction to the Internet, The World Wide Web, Web Browsers, Uniform Resource Locator, The Hypertext Transfer Protocol, Security, Web programmers Toolbox.	**04 Hrs**
2	HTML 5: Canvas, video, local storage, web workers, offline applications, geolocation, placeholders, input types. What does it all mean – doctype, root, headers, articles, dates and times, navigation and footers. Let's call it a drawing surface – Simple shapes, canvas, Paths, texts, gradients and images. The past, present and future of local storage for web applications, A Form of madness – place holders, autofocus fields, email, web addresses, numbers as spinboxes and sliders, date and color pickers, search boxes.	**08 Hrs**
3	CSS3: What is CSS3? Animation with CSS3, Borders with CSS3, Backgrounds with CSS3, Fonts with CSS3, Text effect, transition effects, User Interface and 2D transform.	**04 Hrs**
4	JQuery: Jquerysyntax,jquery selectors ,JQuery events, Basic functions using Jquery	**06 Hrs**
5	Python: Basics syntax, using variables, decision and looping, function used to manipulate data using database.	**05 Hrs**
6	PHP: PHP Basics, Functions, Form Handling, Files, Cookies, Session Tracking, Database Access with PHP and MySQL	**05 Hrs**
7	XML: Introduction, Basic XML, DOM,, Syntax, Elements, Attributes, CDATA, DTD, Namespaces ,Schema, XSLT, HTTP Request, DOM, Querying XML , SAX, Xlink, PHP and XML, RSS Basics	**05 Hrs**
8	JSON:JSON – Array, object, mixing literals, syntax, encoding/decoding, JSON versus XML, server-side JSON tools	**05 Hrs**

Text Books:

1. Robert W. Sebestra, "Programming the World Wide Web", 4th Edition, Addison Wesley, 2008.
2. Albert Lukaszewski, "MySQL for Python" , Packt Publishing, 2010
3. Rob Crowther, "Hello! HTML5 & CSS3", Manning Publications 2012.

References:

1. P. J. Deitel and H.M. Deitel, Internet & World Wide Web How to Program", 4th Edition, Pearson 2009.
2. Mark Summerfield, "Programming in python 3", 2nd Edition, Addison-Wesley, 2009.
3. Mark Lutz, "Python Packet Reference", O'Reilly Media, 4th Edition, 2009

School of Computer Science and Engineering

Course Code: **15ECSP708**	Course Title: **Data Structures and Algorithms Lab**	
L-T-P: **0-0-1.5**	Credits: **1.5**	Contact Hrs:**3hrs/week**
CIE Marks: **80**	SEE Marks: **20**	Total Marks: **100**
Teaching Hrs: **36 hrs**		Exam Duration: **3hours**

Course Learning Outcomes-CLO

At the end of the course students will be able to:

Implement standard data structures like stack, queues, lists and trees in C language.

Choose appropriate data structures to effectively model the information in a problem.

Demonstrate testing and debugging skills for given application.

Implement the data structure as a component.

Use the data structure component to build the applications

2 Course Content

Sl No.	Topic	No. of Lab Slots
1	Over view : Implementation of data structures	1
Basic data structures :		
2	Stack, Queues (Array implementation)	1
3	Linked lists	1
4	Trees	1
Advanced Data Structures :		
5	Skip lists, Red Black and B-Trees	1
6	B-Trees, Splay trees and hash functions	1
7	Heaps and Leftist heaps.	1
Algorithmic Techniques :		
8	Greedy Technique	1
9	Divide and Conquer	1
10	Dynamic Programming	1
11	Back Tracking	1
12	CIE Test	1

School of Computer Science and Engineering

Course Code: **15ECSP709**	Course Title: **DBMS Lab**	
L-T-P: **0-0-1.5**	Credits:1.5	Contact Hrs: 3 hrs/week
CIE Marks: 80	SEE Marks: 20	Total Marks: 100
Teaching Hrs: 36		Exam Duration: 3 hrs

No	Content
1	This course explores database programming using standard Structured Query Language (SQL). Topics include database management systems, database middleware, data definition language, data manipulation language, data control language; database queries reporting, query optimization, and database views. assignments include database creation, query design and programming, and database manipulation via embedded SQL calls from programming language..

Books/References:

i) Elmasri and Navathe: Fundamentals of Database Systems, 5th Edition, Pearson Education,2008.

ii) Introduction to Relational Databases and SQL Programming, Christopher Allen, Simon Chatwin, Catherine A. Vreary Tata McGraw-Hill

iii) Oracle SQL and PL/SQL Hand book, John Adolph Palinski, Pearson Education

iv) Oracle 9i PL/SQL Programming, Scott Urman, Tata McGraw-Hill

v) MySQL: The Complete Reference, Vikram Vaswani, Tata Mcgraw-Hill

vi) MySQL Bible, Steve Suehring, Wiley

School of Computer Science and Engineering

Course Code: **15ECSC712**	Course Title: **Computer Communication and Networks**	
L-T-P: **4-0-0**	Credits: **4**	Contact Hrs:**4 hrs/week**
CIE Marks: **50**	SEE Marks: **50**	Total Marks: **100**
Teaching Hrs: **55 hrs**		Exam Duration: **3 hrs**

1	Review of Basic Concepts Building a Network; Applications; Requirements; Network Architecture; Implementing Network software; Performance.	**06 Hrs**
2	The Application Layer Principles of Application-Layer Protocols, The World Wide Web: HTTP, File Transfer: FTP, Electronic Mail in the Internet, The Internet's Directory Service: DNS, P2P file sharing.	**08 Hrs**
3	The Transport Layer Introduction and Transport-Layer Services, Multiplexing and De-multiplexing , Connectionless Transport: UDP, Principles of Reliable Data Transfer, Connection oriented Transport: TCP, Principles of Congestion Control, and TCP Congestion Control	**08 Hrs**
4	The Network Layer Introduction and Network Service Models, Virtual Circuit and data gram Networks, inside a router, IP: the Internet Protocol, Routing algorithms, Routing in the Internet, Broad cast and multicast routing.	**10 Hrs**
5	Data Link Layer Error Detection and Correction: Introduction, Block coding, Linear block codes, Cyclic Codes: Cyclic Redundancy Check, Hardware Implementation, Polynomials; checksum; Multiple access: Random Access, Controlled Access, Channelization; PPP. Ethernet and Connecting Devices Standard Ethernet, Passive Hubs, Repeaters, Active Hubs, Bridges, Two layer switches, Routers, Three layer switches and Gateways.	**10 Hrs**
6	Wireless Networks Introduction, WiFi: 802.11 Wireless LANs, Cellular Internet Access.	**06 Hrs**
7	Mobile Networks Mobility Management: Principles, Mobile IP, Managing Mobility in Cellular Networks, Wireless and Mobility: Impact on Higher layer protocols.	**07 Hrs**

Text Book

1. J. F. Kurose, K. W. Ross, *Computer Networking, A Top-Down Approach Featuring the Internet*, 3rd Ed, Addison-Wesley 2005.
2. Behrouz Forouzan, *Data Communications and Networking*, McGraw Hill, 4th ed. 2007
3. Larray L Peterson & Bruce S Davien *Computer Networks* ,Morgan Kaufmann (Elsevier), fifth edition, 2011.

References:

1. W. Stallings, Data and Computer Communications, Prentice Hall, Sixth Edition, 2000.
2. Alberto Leon-Garcia & Indra Widjaja Communication Networks-Fundamental concepts and Key Architectures, 2nd edition, Tata McGraw-Hill. 2006
3. Michael A. Gallo & William M Han cock ,Computer Communication and Networking Technologies, Cengage Learning 2008

School of Computer Science and Engineering

Course Code: **15ECRC701**	Course Title: **Philosophy and Practice of Engineering Education**	
L-T-P: **2-0-1**	Credits: **3**	Contact Hrs:**4 hrs/week**
CIE Marks: **50**	SEE Marks: **50**	Total Marks: **100**
Teaching Hrs: **28 hrs**		Exam Duration: **3 hrs**

Course Information

Course Overview

This course intends to provide an overview of the Principles and Practices of Engineering Education. Specifically, the focus of this course revolves around how engineering is best taught and learnt. The overarching goal of this course is to equip prospective engineering faculty members with the tools and techniques that can enhance the effectiveness and efficiency of their teaching practice.

Learning objectives

After successful completion of this course, participants will be able to:

1. Understand fundamental principles of teaching and learning
2. Apply instructional design principles in engineering learning environments
3. Integrate technological tools to enhance learning
4. Analyse learning styles and theories relevant to engineering education
5. Evaluate different types of assessment and evaluation techniques
6. Create engineering learning modules

Reference Materials

Articles from the Engineering Education literature and other Internet resources will be explored in order to meet the course learning objectives.

Schedule of Activities

1st Workshop: Fundamental Principles of Teaching and Learning		
DATE:	**TIME**	**TOPICS**
Session-1	9.30 – 11.00	Introductions, Expectations, Pre-Work, Team Formations
	11.00 - 11.10	Break
Session-2	11.10 - 12.40	Fundamental Principles of Teaching and Learning
	12.40-13.20	Lunch Break
Session-3	13.20-14:50	Teaching Philosophy Statements – Individual
	14.50-15.00	Break
Session-4	15.00-16.30	Course Goals and Objectives: Taxonomies

Assignments due before 2nd Workshop:

1. Revise Teaching Philosophy Statements – Individual work
2. Review Learning Objectives of at least 1 existing course - Teamwork
3. Explain Learning Styles - Team Presentations
4. Explain Learning Theories - Team Presentations

2nd Workshop: Learning Styles and Theories		
DATE:	**TIME**	**TOPICS**
Session-1	9.30 – 11.00	Teaching Philosophy Statements Revisited – Peer Review
	11.00 - 11.10	Break
Session-2	11.10 - 12.40	Learning Styles – Team Presentations
	12.40-13.20	Lunch Break
Session-3	13.20-14:50	Learning Theories – Team Presentations
	14.50-15.00	Break

Session-4	15.00-16.30	Learning Theories – Team Presentations

Assignments due before 3rd Workshop:

1. Discuss Instructional Design Models and their Application – Team Presentations
2. Discuss what role can technology play in the teaching-learning process – 1 page reflection paper – Individual work

3rdWorkshop: Instructional Design Models and Technology Enhanced Learning		
DATE:	**TIME**	**TOPICS**
Session-1	9.30 – 11.00	Instructional Design Models – Team Presentations
	11.00 - 11.10	Break
Session-2	11.10 - 12.40	Technology Enhanced Learning – Explore
	12.40-13.20	Lunch Break
Session-3	13.20-14:50	Technology Enhanced Learning – Explore
	14.50-15.00	Break
Session-4	15.00-16.30	Technology Enhanced Learning – Team Presentations

Assignments due before 4th Workshop:

1. Develop Formative Assessments Strategies – Team Presentations
2. Critique rubrics for at least 1 existing course– Individual work

4thWorkshop: Assessment and Evaluation		
DATE:	**TIME**	**TOPICS**
Session-1	9.30 – 11.00	Basics of Assessment and Evaluation
	11.00 - 11.10	Break
Session-2	11.10 - 12.40	Formative Assessments – Team Presentations
	12.40-13.20	Lunch Break
Session-3	13.20-14:50	Develop Rubrics – Practice and Peer Review
	14.50-15.00	Break
Session-4	15.00-16.30	Develop Rubrics for Team Final Presentations

Assignments due before 5th Workshop:

1. Each team will select a topic/subject area for a teaching demo (microteaching). This demo should incorporate the fundamental principles and best practices of Engineering Education

5th Workshop: Engineering Learning Modules		
DATE:	**TIME**	**TOPICS**
Session-1	9.30 – 11.00	Microteaching – Team Presentations
	11.00 - 11.10	Break
Session-2	11.10 - 12.40	Microteaching – Team Presentations
	12.40-13.20	Lunch Break
Session-3	13.20-14:50	Microteaching – Team Presentations
	14.50-15.00	Break
Session-4	15.00-16.30	Microteaching – Team Presentations

Assessment, Evaluation, and Grading

After every workshop, there will be follow-up assignments due before the next workshop. There will be total 4 assignments of 10 points each. For active participation in workshop activities, maximum of 40 points will be allocated. The last workshop in the course will be teaching demos by participants (microteaching) worth 20 points.

Points

Assignments: 40
Participation: 40

Microteaching: 20

Grades

91-100: S
81-90: A
71-80: B
61-70: C
Below 60: Unacceptable

Course Code: **15ECSE714**	Course Title: **Mobile Application Development**	
L-T-P: **3-1-0**	Credits: **4**	Contact Hrs:**5 hrs/week**
CIE Marks: **50**	SEE Marks: **50**	Total Marks: **100**
Teaching Hrs: **42 hrs**		Exam Duration: **3 hrs**

1	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.	**08 Hrs**
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, The Android Debug Bridge (ADB), Basic Widgets Understanding the Role of Android Application Components, Event Handling , Displaying Messages Through Toast, Creating and Starting an Activity, Using the Edit ext Control . 10 Hours	**10 Hrs**
3	The Android Debug Bridge (ADB): Basic Widgets Understanding the Role of Android Application Components, Event Handling , Displaying Messages Through Toast, Creating and Starting an Activity, Using theEdit ext Control Building Blocks for Android Application Design, Laying Out Controls in Containers, Utilizing Resources and Media, Using Selection Widgets and Debugging Displaying and Fetching Information Using Dialogs and Fragments	**08 Hrs**
4	Widgets and Debugging: Using Selection Widgets and Debugging Displaying and Fetching Information Using Dialogs and Fragments Advanced Android Programming: Internet, Entertainment, and Services, Implementing drawing and animations	**08 Hrs**
5	Displaying web pages and maps: Displaying web pages and maps communicating with SMS and emails. Creating and using content providers: Creating and consuming services, Publishing android applications.	**08 Hrs**

Text Book:

1. Mobile Computing: technologies and Applications- N. N. Jani S chand2009.

References:

1. *B.M.Hirwani- Android programming Pearson publications-2013* M. Tekalp, "Digital Video Processing," Prentice Hall, USA, 1995.

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 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.	3 hrs
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 product build, Communicating the object of defect bash, Setting up monitoring lab, Taking action and Fixing issues, Optimizing the effort involved in defect bash.	5 hrs
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 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.	5 hrs	
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.		

School of Computer Science and Engineering

Program: Master of Technology		
Course Title: **Big Data Analytics**		Course Code: **17ECSE801**
L-T-P: **3-0-1**	Credits: **4**	Contact Hrs: 5 per week
ISA Marks: **50+50**	ESA Marks: **50**	Total Marks: **100**
Teaching Hrs: **42hrs**	Exam Duration: **3 hrs**	

1	**Big Data Overview** Data Structures,Analyst Perspective on Data Repositories, State of the Practice in Analytic, BI Versus Data Science, Current Analytical Architecture, Drivers of Big Data,Emerging Big Data Ecosystem and a New Approach to Analytics, Key Roles for the New Big Data Ecosystem, Examples of Big Data Analytics.	**05hrs**
2	**Data Analytics Lifecycle** Data Analytics Lifecycle Overview, Key Roles for a Successful Analytics Project, Background andOverview of Data Analytics Lifecycle, Phase Discovery, Phase 2: Data Preparation,Phase 3:Model Planning, Phase 4: Mode Building, Common Tools for the Model Building Phase.	**05 hrs**
3	**Review of Basic Data Analytic Methods Using R** Introduction to R :R Graphical User Interfaces , Data Import and Export ,Attribute and Data Types, Descriptive Statistics ,Exploratory Data Analysis, Visualization Before Analysis, DirtyData, Visualizing a Single Variable , Examining Multiple Variables, Data Exploration Versus Presentation, Statistical Methods for Evaluation, Hypothesis Testing.	**07 hrs**
4	**Advanced Analytical Theory and Methods : Clustering** Overview of Clustering: K-means, Use Cases, and Overview of the Method, Determining the Number of Clusters, Diagnostics, Reasons to Choose and Cautions	**05 hrs**
5	**Advanced Analytical Theory and Methods : Regression** Linear Regression, Use Cases, Model Description, Diagnostics, Logistic Regression, Model Description, Diagnostics, Reasons to Choose and Cautions, Additional Regression Models.	**05 hrs**
6	**Advanced Analytical Theory and Methods: Time Series Analysis** Overview of Time Series Analysis, Box-Jenkins Methodology, ARIMA Model, Autocorrelation Function (ACF), Autoregressive Models, Moving Average Models, ARMA and ARIMA Models, Building and Evaluating an ARIMA Model.	**07 hrs**
7	**Advanced Analytical Theory and Methods: Text Analysis** Text Analysis Steps, A Text Analysis Example, Collecting Raw Text, Representing Text, Term Frequency—Inverse Document Frequency (TFIDF), Categorizing Documents by Topics, Determining Sentiments.	**04 hrs**
8	**Advanced Analytics—Technology and Tools: MapReduce and Hadoop** Analytics for Unstructured Data , Use Cases ,MapReduce , Apache Hadoop ,The Hadoop Ecosystem, Pig, Hive, HBase, Mahout, NoSQL.	**04 hrs**

Text Books:

1. EMC Education Services, Data Science and Big Data Analytics: Discovering, Analyzing, Visualizing and Presenting Data, Wiley Publications.

References:

1. Frank J Ohlhorst, ―Big Data Analytics: Turning Big Data into Big Money‖, Wiley and SAS Business Series, 2012.
2. Colleen Mccue, ―Data Mining and Predictive Analysis: Intelligence Gathering and Crime Analysis‖, Elsevier, 2007.
3. Michael Berthold, David J. Hand, Intelligent Data Analysis, Springer, 2007.
4. Bill Franks, ―Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with Advanced Analytics‖, Wiley and SAS Business Series, 2012.

School of Computer Science and Engineering

Program: Master of Technology		
Course Title: **Applied Mathematics**		Course Code: **18ECSC701**
L-T-P: **3-0-1**	Credits: **4**	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.	**07 hrs**
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.	**08 hrs**
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**

Text Books:

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

School of Computer Science and Engineering

Program: Master of Technology		
Course Title: **Internet Of Things**		Course Code: **18ECSC702**
L-T-P: **3-0-0**	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 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.	**04 hrs**
2	**IoT Enabling Technologies:** Wireless Sensor Networks, Cloud Computing, Big Data Analytics, Communication Protocols, Embedded Systems, IoT Levels and Deployment Templates.	**06 hrs**
3	**Domain specific IoTs:** Home Automation, Cities, Environment, Energy, Retail, Logistics, Agriculture, Industry, Health and Lifestyle.	**06 hrs**
4	**IoT Platforms Design Methodology:** IoT Design Methodology, Case Study on IoT System for Weather Monitoring.	**04 hrs**
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.	**06 hrs**
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.	**06 hrs**
7	**IoT Physical Servers & Cloud Offerings:** 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	**05 hrs**
8	**Case Studies Illustrating IoT Design:** Home Automation-smart lighting, home intrusion detection, Cities-smart parking.	**05 hrs**

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

School of Computer Science and Engineering

Program: Master of Technology		
Course Title: **Computer Networks**		Course Code: **18ECSC704**
L-T-P: **3-0-1**	Credits: **4**	Contact Hrs: **5 hrs/week**
ISA Marks: **50**	ESA Marks: **50**	Total Marks: **100**
Teaching Hrs: **42**	Exam Duration: **3 hrs**	

1	**Fundamental Concepts of computer Networks** Basic Definitions in Data Networks, Applications, Requirements, Network Architecture, Packet Size and Optimizations, Performance.	**04 hrs**
2	**Data Link Layer** Perspectives on Connecting, Encoding (NRZ, NRZI,Manchester, 4B/5B), Framing, Error Detection, Reliable Transmission, Ethernet and Multiple Access Networks	**08 hrs**
3	**The Network Layer: Data Plane** Overview of Network Layer, Router Architecture, The Internet Protocol (IP): IPv4, Addressing, IPv6, Generalized Forwarding and SDN	**08 hrs**
4	**The 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)	**08 hrs**
5	**Transport Layer** Introduction and Transport-Layer Services, Multiplexing and De-multiplexing, connectionless Transport: UDP, Connection-Oriented Transport: TCP , Principles of Congestion Control, TCP Congestion Control	**08 hrs**
6	**Application 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	**06 hrs**

Text Books:

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
2. Behrouz Forouzan, Data Communications and Networking, 5th Ed, McGraw Hill, 2012.
3. A S Tanenbaum, D J Wetherall, Computer Networks, 5th Ed., Prentice-Hall, 2010.

School of Computer Science and Engineering

Program: Master of Technology		
Course Title: **Data Structures and Algorithms Lab**		Course Code: **18ECSP706**
L-T-P: **0-0-3**	Credits: **3**	Contact Hrs: **6 hrs/week**
ISA Marks: **80**	ESA Marks: **20**	Total Marks: **100**
Teaching Hrs: **72**	Exam Duration: **3 hrs**	

1	**Introduction**	
	Introduction to data structures, abstract data types and analysis of algorithms.	**04 hrs**
2	**Creation and manipulation of data structures**	
	Stacks and Queues : Array implementation of stacks, queue, Circular queue and Applications of stacks and queues	
	Linked Lists: Singly linked list, doubly linked list. Circular Singly and doubly Linked lists and Applications of linked list.	
	Trees and Graphs: Introduction to trees, Binary search trees, binary tree and tree traversals, Basics of graphs, graph traversals and Applications of trees and graphs.	**06 hrs**
3	**Algorithms**	
	Brute force and Decrease and conquer method : selection sort, insertion sort, radix sort and searching.	
	Hashing: Direct Address Table, Hash Table, Hash Function and Collision Resolution Techniques.	**07 hrs**
4	**Variants of Tree Data Structures:**	
	Dictionaries, Skip lists, Priority queues, Heaps, Leftist trees, AVL, Red Black, B-Trees, Alternative decision tree, Radix trees and Applications	**04 hrs**

List of Sample Assignments:

1. Computer systems must often provide a “holding area” for messages between two processes, two programs, or even two systems. This holding area is usually called a “buffer” and is often implemented as a queue. Simulate the I/O operation of buffer.
2. When you phone the toll-free number for your bank, you may get a recording that says, "Thank you for calling A-1 Bank. Your call will be answered by the next available operator. Please wait”. Simulate the process of answering the calls.
3. Simulate the phonebook feature of mobile.(find name, add entry, owner number and delete all options)
4. Simulate the process of Baggage Scanning machine in the airport.
5. Implement to list the possible correct words when you search for a word in a file or misspell a word
6. An application requires a structure where new nodes can easily added to the front and back of a given node in O(1)
7. Any node can be a starting point. We can traverse the whole list by starting from any point. We just need to stop when the first visited node is visited again.
8. Round robin scheduling by CPU
9. Back word key operation to visit web pages
10. Issuing tickets at the counter in railway station
11. WAP to generate the following pyramid of digits.

232
34543
4567654
567898765

67890109876
7890123210987
890123454321098
90123456765432109
0123456789876543210

Evaluation:

Students Assessment through CIE (80%) + SEE (20%)

ISA (80%)	Assessment	Weightage in Marks
	Minor 1	15
	Minor 2	15
	Hacker Rank Test/ Code chef	20
	Structured Enquiry(2 evaluations)	20
	Hackathon (Industry standard tool based evaluation)	10
ESA (20%)	Refined output of Hackathon evaluation	20
	Total	100

Reference Books

1. Mark Allen Weiss, Data Structures and Algorithm Analysis in C, 2, Pearson Education, 2003
2. Aron M. Tenenbaum, Data Structures using C, 2, PHI, 2006
3. Sartaj Sahni, Data Structures, Algorithms and applications in C++, 2, Universities Press, 2008
4. Horowitz, Sahni, Rajasekaran, , Fundamentals of Computer Algorithms, 1, Galgotia Publications, 2010
5. Michael T. Goodrich, Roberto Tamassia, Algorithm Design and Applications, Wiley Publications, 2015

School of Computer Science and Engineering

Program: Master of Technology		
Course Title: **Python Programming Lab**		Course Code: **18ECSP707**
L-T-P: **0-0-1.5**	Credits: **1.5**	Contact Hrs: **3 hrs/week**
ISA Marks: **80**	ESA Marks: **20**	Total Marks: **100**
Teaching Hrs: **12**	Exam Duration: **3 hrs**	

1	**Python Basics** Types, Variables, and Simple I/O, Branching and Looping, Numbers, Arrays, Lists, Comprehensions, tuples, and Dictionaries, Regular Expressions, Functions, Files and Exceptions,	**03 hrs**
2	**Python libraries :** Data manipulation and processing using numpy, scipy and pandas. Data visualization using matplotlib.	**04 hrs**
3	**Python Frameworks** Introduction to Python Frameworks, components of frameworks, building RESTful web services.	**02 hrs**
4	**Django framework** Introduction to Django, Django's take on MVC: Model, View and Template, Django Forms: Form classes, Validation, Authentication, Advanced Forms processing techniques, working with databases, Integrate with RESTful web services.	**03 hrs**

References:

1. Jeff Forcier, "Python Web Development with Django", 1st edition, Pearson Education, 2008.
2. Mark Lutz, "Programming Python", 4th Edition, O'Reilly, 2010.
3. Michael Dawson, Python Programing for the Absolute Beginner, Premier Press, 3rd Edition 2010.

Evaluation:

Students Assessment through ISA (70%) + ESA (30%)

ISA (70%)	**Assessment**	**Weightage in Marks**
	Exercises (4-Evaluation)	40
	Hacker-rank	20
	Structured Enquiry(1-evaluations)	10
ESA (30%)	Course Project	30
	Total	100

School of Computer Science and Engineering

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

1	**Introduction** Analysis Framework, Asymptotic Notations and Basic Efficiency Classes, Mathematical Analysis of Non-Recursive Algorithms and Mathematical Analysis of Recursive Algorithms.	**06 hrs**
2	**Hashing Technique** Direct Address Table, Hash Table, Hash Function and Collision Resolution Techniques.	**06 hrs**
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 hrs**
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, Approximation algorithms and Randomized algorithms. **NP- Hard and NP Complete:** Examples, proof of NP-hardness and NP-completeness.	**15 hrs**

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

Evaluation Scheme
CIA Scheme

Assessment	Weightage in Marks
Minor -1	15
Minor 2	15
DAA Lab Manual Evaluation coding challenge websites (topcoder/Hackerrank)	10+10
Total	50

School of Computer Science and Engineering

Program: Master of Technology		
Course Title: **Distributed and Cloud Computing**		Course Code: **18ECSC710**
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: **3 hrs**	

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**
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**
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**
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**
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**
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**
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 Books:

1. 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. 2. Anthony T. Velte, Toby J. Velte, Robert Elsenpeter, Cloud Computing, A Practical Approach, 1, McGraw Hil, 2010

School of Computer Science and Engineering

Program: Master of Technology		
Course Title: **Machine Learning**		Course Code: **18ECSC711**
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: **3 hrs**	

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.	**08 hrs**
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.	**07 hrs**
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.	**08 hrs**
4	**Unsupervised Learning: Cluster Analysis** Partitioning methods, Hierarchical Methods, Density based methods, Outlier Detection.	**07 hrs**
5	**Regression Analysis** ANOVA, Linear Discriminant Analysis, Support Vector Machines	**06 hrs**
6	**Reinforcement Learning** Introduction to Reinforcement Learning (RL), Sequential Decision Problems, Passive RL, Active RL, Generalization in RL, Applications of RL	**06 hrs**

Text Books:

4. Jiawei Han, MichelineKamber, and Jian Pei, Data Mining: Concepts and Techniques, 3rd, Morgan Kaufmann, 2011

5. 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.

School of Computer Science and Engineering

Program: Master of Technology		
Course Title: **Image and Video Processing**		Course Code: **18ECSC713**
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: **3 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 hrs**
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 hrs**
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 hrs**
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 hrs**
5	**2-D 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 hrs**
6	**Video Segmentation and Tracking :** Change detection, Spatiotemporal change detection, Motion segmentation, Motion tracking in video : Rigid object tracking and articulated object tracking	**06 hrs**

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.

School of Computer Science and Engineering

Program: Master of Technology		
Course Title: **Cryptography and Network Security**		Course Code: **18ECSC714**
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: **3 hrs**	

1	**Network Security Overview** Computer Security Principles, The OSI Security architecture: Security attacks, services and mechanisms, A model for Network Security, Classical Encryption techniques: Substitution ciphers- Caesar, Monoalphabetic, Playfair and Hill ciphers, Substitution ciphers, Taxonomy of Cryptography and Cryptanalysis.	**08 hrs**
2	**Data Encryption Algorithms** Traditional block cipher structure, Data Encryption Standard, DES example, strength of DES, Multiple DES, block cipher design prinicples, Advanced Encryption Standard, block-cipher modes of operation, Stream Ciphers: RC4 and A5/1.	**08 hrs**
3	**Public-Key Cryptography and Key Management** Elementary Concepts and Theorems In Number Theory, principles of public-key cryptosystems, The RSA algorithm, Diffie-Hellman Key Exchange, Elliptic curve arithmetic, Elliptic key cryptography, Key Distributions and Management, X.509 certificates, public key infrastructure	**08 hrs**
4	**Data Authentication** Cryptographic Hash Functions: applications and requirements, Hash functions based on cipher block chaining, Secure Hash algorithm, SHA3, Message authentication codes: requirements and functions, HMAC, Digital Signatures, and Digital Signature Standard.	**06 hrs**
5	**Application, Transport and Network layer Security** Web security considerations, Pretty Good Privacy and S/MIME,Secure Sockets Layer, HTTPs, Kerberos, SSH, DomainKeys Identified Mail (DKIM), IPSec overview, Encapsulating security payload, combining security associations, Internet key exchange	**06 hrs**
6	**Wireless Network Security** Wireless security threats and measures, mobile device security, IEEE 802.11 WLAN Standard, IEEE 802.11i Wireless Lan Security: Services and phases of operation, WPA and WPA2	**06 hrs**

Text Books:

1. William Stallings, Cryptography and Network Security Principles And Practices, 6th Edition, Pearson, 2014.

References:

2. Behrouz A. Forouzan, "Cryptography and Network Security**",** 6th Edition, Tata McGraw-Hill, 2014.
3. Mark Stamp, "Information Security: Principles and Practices", 2nd Edition, John Wiley and Sons, 2011.

Lab Plan

Expt./Job No.	***Brief description about the experiment/job***	***No. of Lab. Slots***
1.	Demo and practice on Crypto Library	1
2.	Implementation of symmetric key algorithm algorithms	1
3.	Implementation of asymmetric key algorithm algorithms, Hash algorithms	2
4.	Web Security using SSL certificates	1

5.	Secure access to resources to Kerberos	2
6.	Web server security using CAPTCHA	1
7.	Implemenetation of access Control	1
8.	Configuring Firewall, IDS	1

School of Computer Science and Engineering

Program: Master of Technology		
Course Title: **Principles and Practices of Engineering Education**		Course Code: **18ECRC701**
L-T-P: **3-0-0**	Credits: **3**	Contact Hrs: **3 hrs/week**
ISA Marks: **80**	ESA Marks: **20**	Total Marks: **100**
Teaching Hrs: **40**	Exam Duration: **3 hrs**	

1	**Module 1. Basics of Assessment and Evaluation** **Different Methods, Techniques.**	**04 hrs**
2	Module 2. Fundamental Principles of Effective Teaching and Learning Teaching Philosophy, How Learning Works, Classroom Communication Skills, Teaching and Learning Styles, Bloom's Taxonomy.	**06 hrs**
3	Module 3. Fundamentals of Instructional Design Different Instructional Design Models.	**07 hrs**
4	Module 4. Technology Enhanced Learning Role of Technology, TPACK Model, Technology Tools.	**04 hrs**

Text Books:

4. Ambrose, S., Bridges, M., DiPietro, M., Lovett, M., & Norman, M, How learning works: 7
5. Research-Based principles for smart teaching. San Francisco: Jossey-Bass. , San Francisco:Jossey-Bass, 2010

Suggested Web Resources:

1. https://cft.vanderbilt.edu/guides-sub-pages/blooms-taxonomy/
2. http://educationaltechnology.net/instructional-design/
3. https://www.nwea.org/blog/2014/33-digital-tools-advancing-formative-assessmentclassroom/
6. http://oedb.org/ilibrarian/101-web-20-teaching-tools/

School of Computer Science and Engineering

Program: Master of Technology		
Course Title: **Distributed and Cloud Computing**		Course Code: **19ECSC710**
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: **3 hrs**	

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**
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**
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**
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**
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**
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**
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 Books:

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

References:

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