# PANJAB UNIVERSITY CHANDIGARH

**SCHEME AND SYLLABUS**

**FOR**

**MASTER OF ENGINEERING**

**REGULAR PROGRAMME**

IN

INFORMATION TECHNOLOGY

FROM

**1st TO 4th SEMESTER**

**Examination 2019-20**

# First Semester

| S. No | Subject Code | Subject Name | L-T-P | Contact hrs/week | Credits | Marks | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Theory | | Practical* |
| | | | | | | Internal Assessment | University Exam | |
| 1 | MEIT 111 | Advanced Algorithm Analysis | 3-0-2 | 5 | 3+1 | 50 | 50 | 50 |
| 2 | MEIT 112 | Object Oriented Analysis And Design | 3-0-2 | 5 | 3+1 | 50 | 50 | 50 |
| 3 | MEIT 113 | Advanced Digital Signal Processing | 3-0-2 | 5 | 3+1 | 50 | 50 | 50 |
| 4 | MEIT 114 | Wireless & Mobile Comm. | 3-0-2 | 5 | 3+1 | 50 | 50 | 50 |
| 5 | MEIT 115 | Information Security | 3-0-2 | 5 | 3+1 | 50 | 50 | 50 |
| 6 | MEIT 116 | Research Seminar-I | 0-0-2 | 2 | 1 | ---- | ---- | 50 |

 * Practical marks are for continuous and end semester evaluation

**Total Marks: 800**          **Total Credits: 21**

# Second Semester

| S. No. | Subject Code | Subject Name | L-T-P | Contact hrs/week | Credits | Marks | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Theory | | Practical* |
| | | | | | | Internal Assessment | University Exam | |
| 1 | MEIT 211 | Multimedia Systems | 3-0-2 | 5 | 3+1 | 50 | 50 | 50 |
| 2 | MEIT 212 | Embedded System Design | 3-0-2 | 5 | 3+1 | 50 | 50 | 50 |
| 3 | MEIT 213 | Research Methodology | 4-0-0 | 4 | 4 | 50 | 50 | ---- |
| 4 | | Elective – I | 3-0-2 | 5 | 3+1 | 50 | 50 | 50 |
| 5 | | Elective - II | 4-0-0 | 4 | 4 | 50 | 50 | ----- |
| 6 | MEIT 220 | Research Seminar-II | 0-0-2 | 2 | 1 | ---- | ---- | 50 |

* Practical marks are for continuous and end semester evaluation

**Total Marks: 700**          **Total Credits: 21**

| Elective-I | Elective -II |
|---|---|
| (MEIT 214) Agile Software Development<br>(MEIT 215) Advances in Soft Computing<br>(MEIT 216) Theory of Computation | (MEIT 217) Software Testing and Quality Management<br>(MEIT 218) HRD and Training Methods<br>(MEIT 219) Advanced Digital Image Processing |

# Third Semester

| S. No. | Subject Code | Subject Name | L-T-P | Contact hrs/week | Credits | Marks | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Theory | | Practical* |
| | | | | | | Internal Assessment | University Exam | Internal Assessment |
| 1 | | Elective – III | 4-0-0 | 4 | 4 | 50 | 50 | ---- |
| 2 | | Elective – IV | 4-0-0 | 4 | 4 | 50 | 50 | ---- |
| 3 | MEIT 317 | Project-based Thesis Work –I | | 20 | 10 | ---- | ---- | 100 |

\* Practical marks are for continuous and end semester evaluation

**Total Marks: 300**　　　　　　**Total Credits = 18**

| Elective-III | Elective -IV |
|---|---|
| (MEIT 311) Network Management and Security<br>(MEIT 312) User Interface Design<br>(MEIT 313) Cloud Computing | (MEIT 314) Big Data and Analytics<br>(MEIT 315) Advanced Data Mining<br>(MEIT 316) Advanced Computer Networks |

# Fourth Semester:

| S. No. | Subject Code | Subject Name | Contact hrs/week | Credits | Practical Marks | |
|---|---|---|---|---|---|---|
| | | | | | Internal Assessment | University Exam |
| 1 | MEIT 411 | Thesis Work – II | 25 | 15 | 100 | 100 |

**Total marks: 200**　　　　　　**Credits = 15**

**Guidelines for thesis grading in internal assessment**

| S.No. | Grade | Condition |
|---|---|---|
| 1. | A+ | Publication from Thesis in SCI indexed journal. |
| 2. | A | Publication from Thesis in Scopus Indexed Journal. |
| 3. | B+ | Publication from Thesis in Proceedings of Conference which is Scopus indexed. |

**Total marks: 2000**　　　　　　**Credits = 75**

# MASTER OF ENGINEERING IN INFORMATION TECHNOLOGY

## FIRST SEMESTER

## Subject Name:                     Advanced Algorithm Analysis

**Subject Code: MEIT 111**            Max. Marks: 50            Time: 3 hours

Course Duration: 45 lectures of one hour each.

**Note:** The examiner shall set seven questions of 10 marks each. First question has to be compulsory, having parts covering the whole syllabus. Three questions have to be set from Part A and three questions from Part B of the syllabus. Candidate is required to attempt at least two questions from each part. All the course outcomes must be covered by the question paper.

### Part A
**Algorithms Complexity and Analysis:**                                    (6)
Asymptotic analysis: upper and average complexity bounds, Identifying differences among best,average and worst Case Behaviors, Big O, little O, omega and theta notations, Standard complexity classes, Empirical measurements of performance, Time and space tradeoffs in algorithms, Analyzing recursive algorithms using recurrence relations.

**Divide and Conquer algorithms and Greedy Algorithms**                    (6)
Introduction, Quick sort, Strassen's multiplication, Knapsack problem, Minimum spanning tree, Single source shortest path algorithm and their performance analysis

**Dynamic Programming**                                                    (7)
Introduction, 0/1 Knapsack problem, Traveling salesperson problem, Floyd- Warshall algorithm, Multistage graph problem, All pair shortest paths.

### Part B
**Backtracking algorithms**                                                (7)
Introduction, N- Queens algorithm, Sum of subsets, Hamiltonian Circuit problem

**Linear Programming and Reductions**                                      (6)
Introduction, Flow of Networks, Bipartite Matching, Duality, Zero sum games, The simplex algorithm

**String Matching Algorithms**                                            (7)
The Brute force algorithm, String matching with finite automata, Knuth-Morries-Pratt-Algorithm

**NP-Hard ,NP-Complete and Approximation Algorithm**                      (6)
Non-deterministic problem, NP-hard and NP-completeClasses, Introduction to approximation, absolute approximation, polynomial time approximation scheme.

**Text Books**
1.      Cormen, Leiserson, Rivest and Stein," Introduction to Algorithms", PHI.
2.      Horowitz, Sahni and Rajsekaran, "Fundamentals of Computer Algorithms", Galgotia publications.

**References**
   1. Dasgupta, Papadimitriou,Vazirani: "Algorithms" , Tata Mc GrawHill, Ed No-1/2006
   2. Aho, Hopcraft, Ullman        : "The Design and Analysis of Algorithms", Pearson Education Ed-2008

**Practical Task:**                                    **Internal Assessment Marks: 50**
Practical based on theory

# Subject Name:    Object Oriented Analysis And Design

**Subject Code: MEIT 112**          Max. Marks: 50          Time: 3 hours

**Course Duration**: 45 lecturers of one-hour duration each

**Note:** The examiner shall set seven questions of 10 marks each. First question has to be compulsory, having parts covering the whole syllabus. Three questions have to be set from Part A and three questions from Part B of the syllabus. Candidate is required to attempt at least two questions from each part. All the course outcomes must be covered by the question paper.

## Part A
**Object Modeling**                                                        (5)
Objects and classes, Links and Associations, Generalisation and Inheritance,Aggregation, Abstract Classes, Metadata, Candidate Key, Constraints .

**Dynamic Modeling**                                                       (5)
Events and States, Operations, Concurrency, Advanced dynamic modeling concepts,

**Functional Modeling**                                                    (5)
Functional Models,Data Flow Diagrams

**Design Methodology: Analysis**                                           (5)
OMT Methodology, Analysis, Problem Statement, Object modelling, Dynamic modelling, Functional modelling.

**System Design**                                                         (5)
Layers, Partitions, Identifying Concurrency, allocating subsystems to processors and tasks, management of data stores, handling global resources, choosing software control implementation, handling boundary conditions, setting trade off priorities

## Part - B
**Object Design**                                                         (5)
Steps in Object Design, designing algorithm, design optimization, implementation of control, adjustment of inheritance, design of associations, object representation, physical packaging

**Object Oriented Languages**                                             (5)
Class definitions, Creating Objects, Calling Operations, using Inheritance, implementing Associations, Object Oriented Language features

**Non Object Oriented Languages**                                         (5)
Mapping Object Oriented Concepts, Translating Classes into Data Structures, Passing arguments to Methods, Allocating Objects, Implementing Inheritance, Implementing Method Resolution, Implementing Association, Dealing with concurrency, Encapsulation.

**Relational Databases** (5)
DBMS concepts, Relational DBMS concepts, Relational Database Design, Advanced Relational DBMS

**Recommended Books**
1. Object Modeling and Design, James, Rumbaugh, Michael Blaha, William Premerlani, Frederick Eddy and William Lorensen, PHI 1998,2ndEd.
2. Object Oriented Programming in TURBO C++, Robert Lafore, Galgotia Publications Pvt. Ltd., 1994, paperback Ed
3. Programming with C++, D.Ravichandran, Tata McGraw Hill, 1996, 3rd Ed.
4. Object Oriented Programming with C++, Balagurusamy, Tata McGraw Hill Publishing Co. Ltd., 2000, 4th Ed.

**Practical Task:**                           **Internal Assessment Marks: 50**
Practical based on theory

# Subject Name:               Advanced Digital Signal Processing

**Subject Code: MEIT 113**          Max. Marks: 50               Time: 3 hours
**Course Duration:** 45 lectures of one hour each.

**Note:** The examiner shall set seven questions of 10 marks each. First question has to be compulsory, having parts covering the whole syllabus. Three questions have to be set from Part A and three questions from Part B of the syllabus. Candidate is required to attempt at least two questions from each part. All the course outcomes must be covered by the question paper.

# Part A

**Transformations:**                                                    (12)
Review of Z-transform & inverse Z-Transforms and solution of linear differential equations. Discrete Fourier Transform(DFT) and its properties, Computation of linear and circular convolution using DFT, Fast Fourier Transform(FFT) algorithms.

**Design of Digital Filters:**                                          (12)
Finite Impulse Response (FIR) filter-Basic design steps, advantages and disadvantages-Design Techniques: Windowing & Frequency sampling.
Infinite Impulse Response (IIR) filter-Design from analog filters-Impulse Invariance, Bilinear Transformation Method-Direct Design &Magnitude Squared Functions. Design of Butterworth, Chebyshev Filter using above methods.

# Part B

**Digital Filter Structures:**                                          (06)
Structure of digital filter realizations-Basic FIR & IIR structures (Direct Form I and II), Cascade form, Parallel form.

**Introduction of Multi-rate Digital signal Processing:**              (07)
Sampling rate conversion, decimation and interpolation, Digital Filter Banks, Implementation of narrowband lowpass filters, Subband Coding of speech signals.

**Introduction of Adaptive filters:**                                   (08)
System modeling, Adaptive direct form FIR filters, LMS algorithm, Overview of adaptive filter applications, Active noise control using adaptive filters.

**Recommended Books:**
1. Digital Signal Processing by Proakis & Manolakis(PHI)
2. Digital Signal Processing Oppenheim and RW Schieffer.
3. Digital Signal Processing by S.K.Mitra(TMH)
4. Modern Filter Theory by Johnson  & Johnson
5. Theory and Applications of Digital Signal Processing by Rabiner & Gold

**Practical Task:**                              **Internal Assessment Marks: 50**
Practical based on theory

## Subject Name:          Wireless & Mobile Communication

**Subject code: MEIT 114**          Max. Marks: 50          Time: 3 Hours

**Course Duration**: 45 lecturers of one-hour duration each

**Note:** The examiner shall set seven questions of 10 marks each. First question has to be compulsory, having parts covering the whole syllabus. Three questions have to be set from Part A and three questions from Part B of the syllabus. Candidate is required to attempt at least two questions from each part. All the course outcomes must be covered by the question paper.

# Part A

**Introduction**                                                                                      (06)
Evolution of Mobile Radio Communication, Examples of wireless communication systems, Intelligent Network, Modern Wireless Communication Systems: 2G, 2.5G, 3G and 4G.

**Cellular Concepts**                                                                          (10)
Frequency Reuse, Handoff Strategies, Interference and System Capacity, Mechanisms for capacity and coverage improvement-cell splitting, cell sectoring and microcell zone concept

**GSM:**                                                                                            (06)
Services and Features, System Architecture, Radio Aspects, GSM channels and Security Aspects

# Part B

**Multiple Access Techniques**                                                          (05)
Introduction to Multiple Access, FDMA, TDMA, SSMA: types, SDMA, Packet Radio, and CSMA Protocols.

**CDMA (IS-95):**                                                                            (05)
Service Aspects, Radio Aspects, Key Features

**Mobile Radio Propagation:**                                                          (08)
Fading, Types of fading, small scale fading, Equalization, Diversity Techniques: Space Diversity types, Frequency Diversity, Time Diversity, Rake receiver, Interleaving.

**Migration to Advanced Technologies**:                                          (05)
Features, Specifications, Applications and Comparison between: WiFi, WiMax, EDGE, Bluetooth and cdma-2000 Standards.

**Books Recommended**:
1.     Wireless Communications Principles and practice by Theodore S. Rappaport, Prentice Hall India, Edi 2$^{nd}$ .
2.     Wireless and Cellular Communication by Sanjay Sharma , S.K.Kataria & Co., 2009 Ed
3.     Mobile and Personal Communication Systems and services by Raj Pandya, IEEE Press, Ed 1999.

**Practical Task:**                                          **Internal Assessment Marks: 50**
Practical based on theory

# Subject Name:                   Information Security

**Subject Code: MEIT 115**        Max. Marks: 50        Time: 3 hours

Course Duration: 45 lectures of one hour each.

**Note:** The examiner shall set seven questions of 10 marks each. First question has to be compulsory, having parts covering the whole syllabus. Three questions have to be set from Part A and three questions from Part B of the syllabus. Candidate is required to attempt at least two questions from each part. All the course outcomes must be covered by the question paper.

## Part A

**Foundation of Cryptography**        (07)
Introduction to Cryptography, Types of Threats-Passive threats, Active threats, Monoalphabetic Substitution Cipher, Polyalphabetic Substitution Cipher, Transposition Cipher.

**Cipher**        (04)
Block and Stream ciphers, Secret key block ciphers, Stream ciphers

**Symmetric Key Ciphers**        (06)
DES Algorithm, Triple DES, Cryptanlysis of DES, Differential and Linear cryptanalysis.

**Asymmetric Key Ciphers**        (06)
Principles of Public Key Cryptosystems, RSA Systems, Knapsack Systems.

## Part B

**Message Authentication and Hash Functions**        (06)
Authentication Requirements, Authentication Functions, Message Authentication codes, Hash Functions, Hash Algorithms (MD-5 and SHA-1), Key Management Algorithm.

**Digital Signatures And Authentication Protocols**        (04)
Digital Signatures and Digital Signature Standard.

**IP Security**        (06)
Overview, Architecture, Authentication Header, Encapsulating Security Payload (Tunnel and Transport mode)

**Firewalls**        (06)
Design Principles, Characteristics, Capabilities, Limitations, Controls, Types of Firewall, and Trusted systems, Reference monitor concepts.

**Recommended Books**
1. Cryptography and Network Security (Principles and Practices) by William Stallings, 5th Ed Pearson

2. A new Dimensions in Computer data security by Meyer C.H. &Matyas C.M., John Wiley & Sons.2$^{nd}$ Ed
3. Applied Cryptography: Protocols, Algorithms, and Source Code in C, Bruce Schneier, Jophn.John Wiley 2$^{nd}$ Ed
4. Firewalls and Internet Security, Bill Cheswick and Steve Bellovin, Addision-Wesley. 2$^{nd}$ Ed


**Practical Task:**                                                  **Internal Assessment Marks: 50**
　　　　　　　　Practical based on theory

# MASTER OF ENGINEERING IN INFORMATION TECHNOLOGY

## SECOND SEMESTER

## Subject Name:                                              Multimedia Systems

**Subject Code: ME IT 211**          Max. Marks: 50                    Time: 3 hours

Course Duration: 45 lecturers of one hour duration each

**Note:** The examiner shall set seven questions of 10 marks each. First question has to be compulsory, having parts covering the whole syllabus. Three questions have to be set from Part A and three questions from Part B of the syllabus. Candidate is required to attempt at least two questions from each part. All the course outcomes must be covered by the question paper.

## Part A
**Media & Data Streams**                                                                (05)

Types of media, Properties of Multimedia system, Traditional Data Stream Characteristics, Data stream characteristics for Continuous Media,

**Sound & Audio**                                                                        (05)
Basics Sound Concepts, Music: MIDI, Speech-Generation, Analysis and Transmission

**Images and Graphics**                                                                  (05)
Digital Image Representation, Image Format, Computer Image processing-Image Synthesis, Image Analysis, Image Recognition, Image Transmission.

**Video & Animation**                                                                    (06)
Video Signal Representation, Conventional Television Systems, EDTV, HDTV, Basic Concepts of Computer based Animation.

## Part B
**Data Compression**                                                                     (05)
Source, Entropy & Hybrid Coding; Basic Compression Techniques, JPEG; H.261, MPEG, DVI

**Multimedia Operating System**                                                          (06)
Real time, Resource Management, Process Management, Files Systems, System Architecture

**Multimedia Communication Systems**                                                     (06)
Application Subsystems, Transport Subsystem, Quality of Service & Resource Management

**Database Systems**                                                                     (07)
Multimedia DBMS, Characteristics of MDBMS, Data Analysis, Data Structure, Operation on Data, Integration in Database Model.

## Recommended Books

1. Multimedia :Computing ,Communications & Applications  by Ralf Steinmetz  Klara Nahrstedt

2. Multimedia In Action by James E Shuman, Thompson Wadsworth Vikas Publishing 2002 Ed.
3. Multimedia In Practice: Technology and Application by Judith Jeffcoate, Prentice Hall 2$^{nd}$ Ed.
4. Multimedia Technology and Application by David Hillman , Galgotia Publication 2001 Ed
5. Multimedia Systems Design by Prabhat k. Andleigh Kiran Thakkar PHI Paperback Ed.
6. Multimedia Syatem by John F. Koegel Buford, Pearson Education, 2008 Ed


**Practical Task:**                                              **Internal Assessment Marks: 50**

Practical based on theory

**Subject Name:**                                    **Embedded System Design**

**Subject Code: MEIT 212**            Max. Marks: 50                    Time: 3 hours

**Course Duration**: 45 lectures of one hour each.

**Note:** The examiner shall set seven questions of 10 marks each. First question has to be compulsory, having parts covering the whole syllabus. Three questions have to be set from Part A and three questions from Part B of the syllabus. Candidate is required to attempt at least two questions from each part. All the course outcomes must be covered by the question paper.

# Part A

**Introduction to Embedded System:**                                    (03)
Comparison of Microprocessors and Microcontrollers. Comparison between RISC and CISC Processors, Harvard and Von Neuman Architectures. Embedded System classification and characteristics,

**Overview of 8051:**                                    (10)
 Architecture, addressing modes and instructions. Interrupts, Timer/ Counters, Serial Communication and applications. Interfacing, Overview of Atmel 89C51 microcontroller.

**PIC Microcontrollers**                                    (10)
Introduction and features, PIC 16C6X/7X: Architecture, Registers, Reset actions, Memory Organization, Instructions, Addressing Modes, I/O Ports, Interrupts, Timers, ADC. Input Capture, Output Compare, Frequency Measurement, Serial I/O Device

# Part B

**Embedded Core based Design:**                                    (12)
System on chip trends, Overview of Embedded processors like ARM Intel MMX series, Architecture, Organization and Instruction set, Memory management. Data parallel issues e.g. SIMD and other high performance approaches.

**Software Development & Tools**                                    (06)
Embedded System Evolution Trends, Round Robin, Round Robin with Interrupts, Function Scheduling architecture, Real Time scheduling: their development, applications and examples.

**Real Time Operating Systems**                                    (04)
RTOS Architecture, Task and Task States, Tasks and Data, Semaphores and shared data, Operating System Services: message queues, timer function, events, memory management, interrupt Routines in an RTOS environment, Basic Design Using RTOS

## Recommended Books

1. Micro-controllers- Ajay V. Deshmukh, TMH 2005 Ed.
2. An Embedded Software Primer by David E Simon
3. Embedded System Design by Steve Heath (Newnes Publishers, 2nd Ed)
4. ARM system architecture by Steve Furber (Addison Wesley) 1st Ed
5. Programming Embedded System in C/C++ by M.Barr (O'Reilly)2nd Ed

6. Specifications and Design of Embedded Systems by D.D.Gajski et. El. 1$^{st}$ Ed, Pearson
7. Hardware/Software Co-Design: Principles and Practices by J.Straunstrup et.el.2$^{nd}$ Ed, Springee
8. Digital Design by Wakerly 4$^{th}$ Ed. Prentice Hall.

**Practical Task:**                                          **Internal Assessment Marks: 50**

Practical based on theory

# Subject Name: _ Research Methodology

**Subject Code: MEIT 213**          Max. Marks: 50          Time: 3 hours

**Course Duration**: 45 lecturers of one-hour duration each

**Note:** The examiner shall set seven questions of 10 marks each. First question has to be compulsory, having parts covering the whole syllabus. Three questions have to be set from Part A and three questions from Part B of the syllabus. Candidate is required to attempt at least two questions from each part. All the course outcomes must be covered by the question paper.

## Part A

**Introduction to Educational Research**                                     **(02)**
Concept, types-basic, applied and action, Need for educational research

**Reviewing Literature**                                     **(02)**
Need, Sources-Primary and Secondary, Purposes of Review, Scope of Review, Steps in conducting review

**Identifying and defining research problem**                                     **(05)**
Locating. Analyzing stating and evaluating problem, Generating different types of hypotheses and evaluating them.

**Method of Research**                                     **(08)**
Descriptive research design-survey, case study, content analysis, Ex-post Facto Research, Correlational and Experimental Research

**Sampling Techniques**                                     **(06)**
Concept of population and sample' sampling techniques-simple random sampling, stratified random sampling, systematic sampling and cluster sampling, snow ball sampling, purposive sampling, quota sampling techniques determining size of sample

## Part – B

**Design and development of measuring instruments**                                     **(08)**
Design and development of measuring instruments, Tests, questionnaires, checklists, observation schedules, evaluating research instruments, selecting a standardized test.

**Procedure of data collection**                                     **(03)**
Aspects of data collection, coding data for analysis

**Statistical Methods of Analysis**                                     **(07)**
Descriptive statistics: Meaning, graphical representations, mean, range and standard deviation, characteristics and uses of normal curve.

Inferential statistics: t-test. Chi-square tests. Correlation (rank difference and product moment), ANOVA (one way)

**Procedure for writing a research proposal** (02)

Purpose, types and components of research proposal

**Procedure for writing a research report** (02)

Audiences and types of research reports, Format of Research report and journal
Strategies for evaluating, research, disseminating and utilizing research- An Overview

## Recommended Books

1.   Borg, W and Gall, M. Educational Research: An Introduction, New York, Longman, 2003
2.   Cohen, L. Educational Research in class rooms and schools! A Manual of Materials and Methods NY: Harper and Row Publishers,2000
3.   CPSC: Developing Skills in Technician Education Research Modules 1 to 11 Singapore, Colombo Plan Staff College for Technician Education
4.   Garrett, HE and Woodworth, RS Statistics in Psychology and
      Education, Educational Research, Bombay: Vakils Fetter and Simons Ltd. 2003
5.    Gay, LR, Educational Research, Ohio: Charles E. Merril Publishing Company 2000
      Wiersma William Research Methods in Education- An Introduction London, Allyn
        and Bacon, Inc. 2000

<h1 style="text-align:center"><u>ELECTIVE - I</u></h1>

<u>**Subject Name:**</u>                                          <u>**Agile Software Development**</u>

**Subject Code: MEIT 214**              Max. Marks: 50              Time: 3 hours

**Course Duration**: 45 lectures of one hour each.

**Note:** The examiner shall set seven questions of 10 marks each. First question has to be compulsory, having parts covering the whole syllabus. Three questions have to be set from Part A and three questions from Part B of the syllabus. Candidate is required to attempt at least two questions from each part. All the course outcomes must be covered by the question paper.

<h2 style="text-align:center">Part A</h2>

**Fundamentals of Agile**                                                                                     (07)
The Genesis of Agile, Introduction and background, Agile Manifesto and Principles, Overview of Scrum, Extreme Programming, Feature Driven development, Lean Software Development, Agile project management, Design and development practices in Agile projects, Test Driven Development, Continuous Integration, Refactoring, Pair Programming, Simple Design, User Stories, Agile Testing, Agile Tools

**Agile Scrum Framework:**                                                                                     (10)
Introduction to Scrum, Project phases, Agile Estimation, Planning game, Product backlog, Sprint backlog, Iteration planning, User story definition, Characteristics and content of user stories, Acceptance tests and Verifying stories, Project velocity, Burn down chart, Sprint planning and retrospective, Daily scrum, Scrum roles – Product Owner, Scrum Master, Scrum Team, Scrum case study, Tools for Agile project management

**Agile Testing:**                                                                                     (10)
The Agile lifecycle and its impact on testing, Test-Driven Development (TDD), xUnit framework and tools for TDD, Testing user stories - acceptance tests and scenarios, Planning and managing testing cycle, Exploratory testing, Risk based testing, Regression tests, Test Automation, Tools to support the Agile tester

<h2 style="text-align:center">Part B</h2>

**Agile Software Design and Development:**                                                                     (13)
Agile design practices, Role of design Principles including Single Responsibility Principle, Open Closed Principle, Liskov Substitution Principle, Interface Segregation Principles, Dependency Inversion Principle in Agile Design, Need and significance of Refactoring, Refactoring Techniques, Continuous Integration, Automated build tools, Version control

**Industry Trends:**                                                                                     (05)
Market scenario and adoption of Agile, Agile ALM, Roles in an Agile project, Agile applicability, Agile in Distributed teams, Business benefits, Challenges in Agile, Risks and Mitigation, Agile projects on Cloud, Balancing Agility with Discipline, Agile rapid development technologies

<p style="text-align:center">19</p>

**Recommended Books**

1. Joshy Joseph, Craig Fellenstein , Grid Computing, First Edition, Pearson Education, 2004.
2. Broken Agile by Tim Brizard, Apress, 2015.
3. Agile Android by Godfrey Nolan, Apress, 2015.
4. Agile Performance Improvement by Bob Winter, Apress, 2015
5. JIRA Agile Essentials by Patrick Li, Packt Publishing, 2015
6. Agile Software Development with Scrum By Ken Schawber, Mike Be, Pearson, 2008.
7. Agile Software Development, Principles, Patterns and Practices By Robert C. Martin, Prentice Hall, 2002.
8. Agile Testing: A Practical Guide for Testers and Agile Teams By Lisa Crispin, Janet Gregory, Addison Wesley, 2008

**Practical Task:**                                          **Internal Assessment Marks: 50**

Students should implement (and learn to use the tools to accomplish this task) the following during Practical hours: (illustrative only)

1.      Understand a given business scenario and identify product backlog, user stories and sprint tasks
2.      Define user stories for a given feature

3.      Fill user stories, sprint schedule and sprint tasks in an Agile tool such as AgileFant
4.      Write unit tests aligned to xUnit framework for TDD
5.      Refactor a given design for next sprint requirements
6.      Execute continuous integration using a tool such as Jenkins
Automate a set of given tests using Test automation tool.

# Subject Name:                    Advances in Soft Computing

**Subject Code: MEIT 215**          Max. Marks: 50                    Time: 3 hours

Course Duration: 45 lectures of one hour each.

**Note:** The examiner shall set seven questions of 10 marks each. First question has to be compulsory, having parts covering the whole syllabus. Three questions have to be set from Part A and three questions from Part B of the syllabus. Candidate is required to attempt at least two questions from each part. All the course outcomes must be covered by the question paper.

## Part A

**ISSUES IN EXPERT SYSTEMS**                                                      (8)
Knowledge representation, planning and acting in real world,  semantic networks, predicate calculus, structural/casual networks, inference control, theorem proving, deduction, truth maintenance, planning, case study of one or more examples from Natural Language Processing, question answering, vision, expert systems

**ARTIFICIAL NEURAL NETWORKS**                                                    (12)
 Concepts of Artificial Neural Networks and its basic mathematical model, simple perceptron, Feed-Forward Multilayer perceptron, Hopfield network, Self organizing network and recurrent network.

**FUZZY LOGIC SYSTEM**                                                            (8)
Fuzzy logic, Fuzzification, Inferencing and defuzzification, Fuzzy Knowledge and rule bases, Fuzzy modeling and Control schemes

## Part B

**GENETIC ALGORITHM**                                                            (10)
Genetic algorithm and detail algorithmic steps, Adjustment of    free    parameters,    Search techniques like tabu search and ant-colony for solving optimization problems, Optimization techniques: PSO (Particle Swarm Optimization), ACO(Ant-colony Optimization), BVO(Binary Vector Optimization).

**APPLICATIONS OF GA**                                                           (7)
Application to power system optimization problem, Identification and control of linear and nonlinear dynamic systems, stability analysis of Fuzzy control systems.

### Recommended Books

1. Artificial Intelligence: A Modern Approach by S. Russel and P. Norvig, Prentice Hall.
2. Artificial Intelligence by Elaine Rich, Kevin Knight, Mc-Raw Hill.
3. Principles of Soft Computing by S. N. Sivanandam, S.N. Deepa, Wiley, 2nd edition.
4. Neuro fuzzy and soft computing by Jang, Pearson Education, 1996.

**Practical Task:**                                    **Internal Assessment Marks: 50**
Practical based on theory

# Subject Name:          Theory of Computation

**Subject Code: MEIT 216**       Max. Marks: 50       Time: 3 hours

**Course Duration:** 45 lectures of one hour each.

**Note:** The examiner shall set seven questions of 10 marks each. First question has to be compulsory, having parts covering the whole syllabus. Three questions have to be set from Part A and three questions from Part B of the syllabus. Candidate is required to attempt at least two questions from each part. All the course outcomes must be covered by the question paper.

# Part A

**Finite Automata** (10)
Finite state machine & its limitation, Regular expressions, Transition Graph, Kleene's Theorem, Equivalence Theorem.

**Turing Machine** (11)
Turing machine, Post machines, Finite machines with pushdown store, non-determinism, turning machines as acceptors, formal language, primitive recursive function, halting problem, solvability of class, post correspondence problems, partial solvability.

# Part B

**Predicate calculus** (14)
Introduction, Basic Notations, Semantics, Equivalence Of WFFs, Normal Form Of WFFs, Validity Theorem, Natural Deduction, Rules For Connectives, Rules For Quantifiers, Derived Rules Of Inference, Rules Of Operators, The Resolution Methods, Herbands Procedure, Davis And Putnam's Method, The Ground Resolution Methods Unification Algorithms, The Resolution Rule.

**Verification of programs** (10)
Flow chart program, partial correctness, inductive assertion methods, termination

### Recommendation Books

1. Mathematical theory of computation by Zohar and Manna, Pub-Dover, 2$^{nd}$ Ed, 2003
2. Theory of Computer science(Auto Mata,Language & Computation) by K.L.P Mishra and N. Chandrashekharan,3$^{rd}$ Ed, PHI
3. Introduction to Formal Language & Automata Peter Linz, 4$^{th}$ Ed, Narosa Publishers

**Practical Task:**          **Internal Assessment Marks: 50**
Practical based on theory

# Elective -II

## Subject Name:  Software Testing and Quality Management

**Subject Code: MEIT 217**     Max. Marks: 50     Time: 3 hours

**Course Duration**: 45 lectures of one hour each.

**Note:** The examiner shall set seven questions of 10 marks each. First question has to be compulsory, having parts covering the whole syllabus. Three questions have to be set from Part A and three questions from Part B of the syllabus. Candidate is required to attempt at least two questions from each part. All the course outcomes must be covered by the question paper.

## Part A

**Software Quality**     (05)

Ethical Basis for Software Quality, Quality Concepts, Total quality Management Principles, Software Quality Assurance, Software Reviews, Formal Technical Reviews, SQA Plan, Quality Standards, Practices & conventions.

**Software Development**     (08)

Development models, Cleanroom methodology, Defect Prevention, Enterprises Resource Planning Software, Measurement Theory, Software quality metrics, designing software measurement programs, organizational learning.

**Improving quality with methodologies**     (06)

Quality tools, Object-Oriented Software, Reverse Engineering, Measuring Customer Satisfaction, Reliability Models, Reliability Growth Models.

## Part B

**Software Quality Engineering**     (07)

Defining Quality Requirements, Requirement Management, Complexity Metrics And Models, Use Of CASE Tool Technology, Role Of Groupware, Data Quality Control

**Project Configuration Management**     (06)

Configuration Management Concepts, Configuration Management Process, Document Control, Configuration Management Plan of the WAR Project.

**Software Testing**     (07)

Introduction to software testing, verification and validation, testing techniques: Dynamic testing and static testing, Validation activities: Unit, Integration, function & System testing, Regression testing.

**Risk Management**     (06)

Risk Identification, Risk Projection, risk refinement, Risk mitigation, Monitoring and Management, The RMMM plan

**Recommended Books**

1. Metrics and Models in Software Quality Engineering, by Stephen H. Kan, Pearson Education, second edition
2. Software Engineering, by Pressman, 6$^{th}$ edition, Tata McGraw Hills.
3. Software Engineering, by Ian Sommerville, Addison Wesley, 7$^{th}$ edition.
4. Effective Methods for Software Testing, by William E. Perry, Second Edition, John Wiley & Sons.
5. Software Testing: Principles and Practices, by Naresh Chauhan, Oxford Higher education

# Subject Name: Human Resource Development & Training Methods

**Subject Code: MEIT 218**                   Max. Marks: 50                   Time: 3 hours
**Course Duration**: 45 lectures of one hour each.

**Note:** The examiner shall set seven questions of 10 marks each. First question has to be compulsory, having parts covering the whole syllabus. Three questions have to be set from Part A and three questions from Part B of the syllabus. Candidate is required to attempt at least two questions from each part. All the course outcomes must be covered by the question paper.

## Part A

**Introduction to Human Resource Development**                                    (06)
Evolution, Mission and Purpose, Components of HRD, HRD problems and issues related to Indian Industry and technical, education, HRD in the context of new Industrial policy.

**Staff Development, Professional Development and Career Development**            (06)
Stages Of HRD, Initial Or Induction Training, Training For Job-Related/Professional Development, Training For Horizontal And Vertical Mobility Of Employees.

**Concept of Training**                                                           (05)
Assumptions for prevailing and alternative concept of training; action through training or action through force.

**Training Strategy**                                                             (05)
Strategic issue; basic phases; modalities in training; formulating a coherent strategy.

## Part B

**Training Methods**                                                              (05)
Learning on the job – Training in the field, simulating real life – role playing and games, incidents and cases – individualized training, seminars and syndicates; lecture method.

**Developing Group and the Climate**                                             (05)
The social process; indicators of group development; training climate.

**Evaluation of Training**                                                        (05)
Issues for evaluations; role of the training system with evaluators from other constituencies.

**Systems Approach to HRD**                                                       (08)
Assessing Need For HRD, Definition And Importance Of Needs Assessment, Methods Employed In Needs Assessment, (Interviews, Questionnaire, Tests, Records And Reports Study, Job Analysis And Performance Reviews), Strategies For HRD, On The Job, Off The Job, Programme Planning, Design, Implementation And Evaluation.

**Recommended Books**
1. Principles of Human Resource Development by JW Gilley and SA England.
2.  Human Resource Development by PP Arya and BB Tandon.

3.  HRD Training and Development by RF Mayer and Peter Pipe.

# Subject Name:          Advanced Digital Image Processing

**Subject Code: MEIT 219**        Max. Marks: 50        Time: 3 hours
**Course Duration:** 45 lectures of one hour each.

**Note:** The examiner shall set seven questions of 10 marks each. First question has to be compulsory, having parts covering the whole syllabus. Three questions have to be set from Part A and three questions from Part B of the syllabus. Candidate is required to attempt at least two questions from each part. All the course outcomes must be covered by the question paper.

## Part A

**Image fundamentals and Transforms:**        (06)
Steps in Image processing, Building blocks of Digital Image Processing System, Digital Image representation, Sampling and Quantization, Basic relationship between Pixels. Problem and application areas of digital image processing, Fourier transforms, Discrete Fourier Transform, Properties of Fourier Transform, Fast Fourier Transform, Discrete Cosine Transform, Wavelet transform, Intensity transform functions, Histogram processing,.

**Image Enhancement Techniques:**        (10)
Spatial Domain and frequency domain approaches, Image subtraction, image average, Low-pass spatial filters, Median filters, High-pass spatial filters, derivative filters , Frequency domain ideal low-pass filters, Butterworth Low pass filters, high pass filters , homomorphic filters

**Image Restoration:**        (06)
Image degradation and restoration process, Noise models, Noise filters, Estimation of degradation function, Inverse filtering, Least Mean Square filter.

## Part B

**Color Image Processing:**        (05)
Color image representation, Color Models, Pseduocolor image processing, color transformations, noise removal in color images.

**Image Compression:**        (06)
Coding redundancy, Inter-pixel redundancy, Psycho-visual redundancy, image compression models, Huffman coding, Lossy compression techniques, Threshold coding, Vector quantization, JPEG compression

**Image Segmentation:**        (06)
Detection of isolated points, line detection, edge detections using gradient operator & laplacian operator, edge linking and boundary detection, region oriented segmentation, segmentation using threshold

**Image Representation & Object Recognition:**        (06)
Boundary representation: chain codes, polygon approximation, Boundary segments, Boundary descriptors; Simple descriptor, Fourier descriptor, Regional descriptors: Simple descriptor & Texture descriptor. Introduction to Object Recognition methods.

**Text Book:**

1. Gonzalez and Woods          : Digital Image processing, Pearson educations, 2nd Edition.

**Reference Books:**

1. Anil K. Jain          : Fundamentals of digital image processing, PHI.

2. Sonka, Hlavac, Boyle          : Image Processing, Analysis and Machine Vision 2nd Edition, PWS Publishing.

3. S.Annadurai & R. Shanmugalakshmi      : Fundamentals of digital image processing, Pearson education, Latest edition.

# MASTER OF ENGINEERING IN INFORMATION TECHNOLOGY

## THIRD SEMESTER

# Elective-III

**Subject Name:** **NetworkManagement and Security**

**Subject Code: MEIT 311**           Max. Marks: 50           Time: 3 hours

**Course Duration:** 45 lectures of one hour each.

**Note:** The examiner shall set seven questions of 10 marks each. First question has to be compulsory, having parts covering the whole syllabus. Three questions have to be set from Part A and three questions from Part B of the syllabus. Candidate is required to attempt at least two questions from each part. All the course outcomes must be covered by the question paper.

### PART – A

**Introduction**                                                                                                (5)
Classical security Techniques and Computer Network Security Concepts. Confidentiality and Security, Security Policy and Operations Life Cycle, Security System Development and Operations

**Secure Networking Threats**                                                                           (6)
The Attack Process. Attacker Types. Vulnerability Types. Attack Results. Attack Taxonomy. Threats to Security: Physical security, Biometric systems, monitoring controls, and Data security and intrusion and detection systems.

**Encryption Techniques**                                                                               (6)
Conventional techniques, Modern techniques, DES, DES chaining, Triple DES, RSA algorithm, Key management. Message Authentication and Hash Algorithm, Authentication requirements and functions secure Hash Algorithm, Message digest algorithm, digital signatures. AES Algorithms.

**Designing Secure Networks**                                                                        (8)
Components of a Hardening Strategy. Network Devices. Host Operating Systems. Applications. Appliance-Based Network Services. Rogue Device Detection, Network Security Technologies The Difficulties of Secure Networking. Security Technologies. Emerging Security Technologies General Design Considerations, Layer 2 Security Considerations. IP Addressing Design Considerations. ICMP Design Considerations. Routing Considerations. Transport Protocol Design Considerations

### PART - B

**Network Security Platform Options**                                                           (6)
Network Security Platform Options. Network Security Device Best Practices, Common Application Design Considerations. E-Mail. DNS. HTTP/HTTPS. FTP. Instant Messaging.

**IPsec VPN Design Considerations** (6)

VPN Basics. Types of IPsec VPNs. IPsec Modes of Operation and Security Options. Topology Considerations. Design Considerations. Site-to-Site Deployment Examples.

**Secure Network Management and Network Security Management** (8)

Organizational Realities. Protocol Capabilities. Tool Capabilities. Secure Management Design Options. Network Security Management, Firewalls, Trusted systems, IT act and cyber laws.

**Text:**
1. Sean Convery, " Network Security Architectures, Published by Cisco Press, First Ed. 2004
2. William Stalling "Cryptography and Network Security" Pearson Education

**References:**
1. Charels P. Pfleeger "Security in Computing" Prentice Hall
2. Jeff Crume "Inside Internet Security" Addison Wesley

# Subject Name:                              User Interface Design

**Subject Code: MEIT 312**          Max. Marks: 50                Time: 3 hours

**Course Duration**: 45 lectures of one hour each.

**Note:** The examiner shall set seven questions of 10 marks each. First question has to be compulsory, having parts covering the whole syllabus. Three questions have to be set from Part A and three questions from Part B of the syllabus. Candidate is required to attempt at least two questions from each part. All the course outcomes must be covered by the question paper.

## Part A

**User Interface: An introduction and overview**                              (06)
Importance of user interface, goals of user interface design, characteristics of graphical and web user interfaces

**The User Interface Design Process**                              (05)
Obstacles And Pitfalls In The Development Path, Usability, The Design Team, Managing Design Process.

**Human Computer Interaction**                              (08)
Importance Human Characteristics In Design, Cognitive Engineering, Mental Models, User Psychology, Interaction Styles And Hypermedia.

**Visual C++ Basics**                              (06)
Introduction to Visual C++, building a basic applications, Visual C++ resources.

## Part B

**Graphical User Interface**                              (08)
Creating menus, working of menus, dialog boxes, combo box, child windows, buttons, check boxes, radio buttons.

**Visual C++ and Database Management**                              (08)
Open Database Connectivity, Data Access Objects, OLE-DB, building a database application using ODBC.

**Application Development in Visual C++**                              (04)
Designing application with security, building a help file, packaging the application.

**Recommended Books**
1. Designing the user interface, Ben Shneiderman, Third Edition, Pearson Education.
2. Johan Paul Mueller: Visual C++ from the Ground UP (PHI Publication), 2nd Edition.
3. Nathan Gurewich and Ori: Visual C++ (Techmedia), 2nd edition
4. The Essential Guide to User Interface Design: Wilbert O. Galitz, WILEY, 2nd edition.

# Subject Name: Cloud Computing

**Subject code**: **MEIT 313**          Max. Marks: 50          Time: 3 hours

**Course Duration:** 45 lectures of one hour each.

**Note:** The examiner shall set seven questions of 10 marks each. First question has to be compulsory, having parts covering the whole syllabus. Three questions have to be set from Part A and three questions from Part B of the syllabus. Candidate is required to attempt at least two questions from each part. All the course outcomes must be covered by the question paper.

## Part A
### Overview of Cloud Computing                                    (4)
Brief history andevolution - History of Cloud Computing, Evolution of Cloud Computing, Traditional vs. Cloud Computing. Why Cloud Computing, Cloud service models (IaaS, PaaS & SaaS). Cloud deployment models (Public, Private, Hybrid and Community Cloud), Benefits and Challenges of Cloud Computing.

### Working with Private Cloud                                    (11)
Basics of virtualization, Virtualization technologies, Server virtualization, VM migration techniques, Role of virtualization in Cloud Computing. Business cases for the need of Cloud computing environment, Private Cloud Definition, Characteristics of Private Cloud, Private Cloud deployment models, Private Cloud Vendors, Private Cloud Building blocks namely Physical Layer, Virtualization Layer, Cloud Management Layer, Challenges to private Cloud, Virtual Private Cloud. Implementing private cloud (one out of CloudStack, OpenStack, Eucalyptus, IBM or Microsoft)

### Working with Public Clouds                                    (11)
What is Public Cloud, Why Public Cloud, When to opt for Public Cloud, Public Cloud Service Models, and Public Cloud Players. Infrastructure as a Service Offerings, IaaS Vendors, PaaS offerings, PaaS vendors, Software as a Service. Implementing public cloud (one out of AWS, Windows Azure, IBM or Rackspace)

## Part  B

### Overview of Cloud Security                                    (6)
Explain the security concerns in Traditional IT, Introduce challenges in Cloud Computing in terms of Application Security, Server Security, and Network Security. Security reference model, Abuse and Nefarious Use of Cloud Computing, Insecure Interfaces and APIs, Malicious Insiders, Shared Technology Issues, Data Loss or Leakage, Account or Service Hijacking, Unknown Risk Profile, Introduce the different vendors offering Cloud Security for public and private clouds.

### Overview of Multi-Cloud Management Systems                    (4)
Explain concept of multi-cloud management, Challenges in managing heterogeneous clouds, benefits and advantages of multi-cloud management systems. Implementing Multi-Cloud Management System (e.g. RightScale Cloud Management System)

**Business Clouds** (5)

Cloud Computing in Business, Various Biz Clouds focused on industry domains (Retail, Banking and Financial sector, Life Sciences, Social networking, Telecom, Education). Cloud Enablers (Business Intelligence on cloud, Big Data Analytics on Cloud)

**Future directions in Cloud Computing** (4)

Future technology trends in Cloud Computing with a focus on Cloud service models, deployment models, cloud applications, and cloud security. Migration paths for cloud, Selection criteria for cloud deployment. Current issues in cloud computing leading to future research directions.

**Recommended Books**

1. Cloud Computing: Principles and paradigms By Raj Kumar Buyya, James Broberg, Andrezei M.Goscinski, 2011
2. Cloud Computing, By Michael Miller, 2008.
3. Cloud Computing for dummies, By Judith Hurwitz, Robin Bllor, Marcia Kaufman, Fern Halper, 2009.
4. Cloud Computing: A Practical Approach, By Anthony T. Velte, Toby J. Velte, and Robert Elsenpeter, McGraw Hill, 2010.
5. Handbook of Cloud Computing, By Borko Furht, Armando Escalante (Editors), Springer, 2010.

**Reference Books**

3. Cloud computing: Implementation, management and security By Rittinghouse, John, W.
2. Cloud Computing Bible, By Barrie Sosinsky, Wiley, 2011
1. Cloud Computing Architected: Solution Design Handbook by Rhoton, John.
2. Cloud Security, A comprehensive Guide to Secure Cloud Computing by Krutz, Ronald L.; Vines, Russell Dean

# Elective IV

## Subject Name:                                    Big Data and Analytics

**Paper Code: MEIT 314**                    Max. Marks: 50                    Time: 3 hours
**Course Duration**: 45 lectures of one hour each.

**Note:** The examiner shall set seven questions of 10 marks each. First question has to be compulsory, having parts covering the whole syllabus. Three questions have to be set from Part A and three questions from Part B of the syllabus. Candidate is required to attempt at least two questions from each part. All the course outcomes must be covered by the question paper.

## Part A

**Digital Data:**                                                                                     (5)
Types of Digital Data-Structured(Sources of structured data, Ease with Structured data), Semi-Structured(Sources of semi-structured data), Unstructured (Sources of unstructured data, Issues with terminology, Dealing with unstructured data).

**Introduction to Big Data:**                                                                  (2)
What is big data?, Why big data? ,Other characteristics of data but not definitional for big data, Challenges with big data, Big data stack

**Technology Landscape:**                                                                     (6)
Big Data Analytics, Analytics 1.0, Analytics 2.0, Analytics 3.0, Traditional BI vs. Big Data Environment, Big Data technology Landscape, NoSQL Databases, NoSQL Vs. RDBMS, New SQL, Hadoop, Hadoop 1.0 vs. Hadoop 2.0, Data Science is multi-disciplinary, Data Scientist - Your new best friend

**Introduction to Hadoop:**                                                                  (9)
Introducing Hadoop, Why not RDBMS, Distributed Computing Challenges, A Brief History of Hadoop, Hadoop Overview, Hadoop Components, High Level Architecture of Hadoop, Hadoop Distributed File System, HDFS Architecture, Daemons Related to HDFS, Working with HDFS Command, Special Features of Hadoop, Processing Data With Hadoop, Introduction, How Map Reduce Works, Map Reduce Example, Word Count Example using Java, Managing Resources and Applications with YARN, Introduction, Limitation of Hadoop 1.0,Hadoop 2: HDFS, Hadoop 2: YARN, Interacting with Hadoop EcoSystem, Hive, Pig, HBASE, Sqoop, Business Intelligence on Hadoop

**Mongo DB:**                                                                                       (2)
Recap of NoSQL databases, MongoDB – CRUD, MongoDB- Arrays, Java Scripts, Cursors, Map Reduce Programming, Aggregations

**Cassandra:**                                                                                      (2)
Cassandra- CQLSH - CRUD, Counter, List, Set, Map, Tracing

# Part B

**Introduction to Hive:** (8)

Introduction to Hive - The Problem, Solution - Hive Use Case, Data Growth, Schema Flexibility and Evolution, Extensibility, What is Hive, History of Hive and Recent Releases of Hive, Hive Features, Hive Integration and Work Flow, Hive Data Units, Hive Architecture, Hive Primitive Data Types and Collection Types, Hive File Formats, Hive Query Language – Statements, DDL, DML, Hive Partitions, Bucketing, Views, Sub query, joins, Hive User Defined Function, Aggregations in Hive, Aggregations in Hive, Serialization and Deserialization,, Hive Analytic Functions

**Introduction to Pig:** (9)

Introducing Pig, History and Anatomy of Pig, Pig on Hadoop, Pig Features, Pig Philosophy, Word count example using Pig, Use Case for Pig, Pig Primitive Data Types, Collection Types and NULL, Pig Latin Overview, Pig Latin Grammar - Comments, Keywords, Identifiers, Case sensitivity in Pig, Common Operators in Pig, Pig Statements- LOAD, STORE, DUMP, Interactive Shell – GRUNT, FILTER, SORT, GROUP BY, ORDER BY, JOIN, LIMIT, Pig Latin Script, Local Mode, Map Reduce Mode, Running Pig Script, Working with, Field, Tuple, Bag, User Defined Function, Parameters in Pig

**Introduction to Jasper Report:** (2)

Introduction to Jasper Report using Jasper Soft Studio, Reporting using MongoDB, Reporting using Cassandra

**Recommended Books:**
1. Big Data and Analytics by Seema Acharya and Subhashini Chellappan, Wiley, 2015.
2. Data Science and Big Data Analytics by EMC Education Services, 2015
3. Big Data Big Analytics by Michael Minelli, Michele Chambers and Ambiga Dhiraj, Wiley, 2013.
4. Big Data Analytics with R and Hadoop by Vignesh Prajapati, PACKT Publishing, 2013.

# Subject Name:            Advanced Data Mining

**Paper Code: MEIT 315**          Max. Marks: 50        Time: 3 hours
**Course Duration**: 45 lectures of one hour each.

**Note:** The examiner shall set seven questions of 10 marks each. First question has to be compulsory, having parts covering the whole syllabus. Three questions have to be set from Part A and three questions from Part B of the syllabus. Candidate is required to attempt at least two questions from each part. All the course outcomes must be covered by the question paper.

## Part A

**Introduction to Data Warehousing** (02)
Data Warehousing Definition and characteristics, need for data warehousing, DBMS vs. data warehouse, OLAP

**Data Warehousing Components** (04)
Overall Architecture, Data Warehouse Database, Sourcing Acquisition, Cleanup and Transformation Tools, Metadata Access Tools, Data Marts, Data Warehouse Administration and Management, Information Delivery Systems.

**Mapping the Data Warehouse to a Multiprocessor Architecture** (04)
Relational Database Technology for Data warehouse, Database Architectures for Parallel Processing, Parallel RDBMS features, Alternative Technologies, Parallel DBMS Vendors.

**Introduction to Data Mining** (04)
Functionalities, classification data mining systems, Multidimensional data model, data cubes, Schemas for multidimensional databases, OLAP operations, Data Marts, Metadata.

**Data Preprocessing** (03)
Data cleaning, integration and transformation, Data reduction, Discretization and Concept Hierarchy Generation.

**Concept Description** (04)
Data Mining techniques-Concept description, attribute oriented induction, analytical characterization, mining class comparisons, mining descriptive statistical measures.

## Part B

**Association Rule Mining** (05)
Mining single dimension rules from transactional databases, Apriori algorithm, efficiency, mining rules without candidate generation.

**Applications and Trends In Data Mining** (02)
Commercial Importance of DW, applications of data mining, data mining in business process, Embedded data mining.

**Introduction to Business Intelligence:** (03)

Introduction to OLTP and OLAP, BI Definitions & Concepts, Business Applications of BI, BI Framework, Role of Data Warehousing in BI, BI Infrastructure Components – BI Process, BI Technology, BI Roles & Responsibilities

**Basics of Data Integration (Extraction Transformation Loading)** (04)

Concepts of data integration, need and advantages of using data integration, introduction to common data integration approaches, introduction to ETL, Introduction to data quality, data profiling concepts and applications.

**Introduction to Multi-Dimensional Data Modeling,** (03)

Introduction to data and dimension modeling, multidimensional data model, ER Modeling vs. multi dimensional modeling, concepts of dimensions, facts, cubes, attribute, hierarchies, star and snowflake schema.

**Basics of Enterprise Reporting** (02)

Introduction to enterprise reporting, concepts of dashboards, balanced scorecards, and overall architecture.

**Data Mining Functionalities:** (05)

Association rules mining, Mining Association rules from single level, multilevel transaction databases, Classification and prediction, Decision tree induction, Bayesian classification, k-nearest neighbor classification

## Recommended Books

1. Data Mining –Concepts & Techniques; Jiawei Han & Micheline Kamber, Morgan Kaufmann Publishers.
2. Data Warehouseing in the Real World; Sam Anahory & Dennis Murray; Pearson Education
3. "Data Mining" by Pieter Adrians, Dolf Zantinge, Addison Wesley, 1996.
4. Data Warehousing, Data Mining and OLTP; Alex Berson, 1997, McGraw Hill.
5. Data Warehousing System; Mallach; 2000, McGraw Hill.
6. Building the Data Warehouses; W.H.Longhman, C.Klelly, John wiley & Sons.
7. "Data Warehousing: Concepts, Techniques, Products and Applications", by C.S.R. Prabhu Prentice Hall of India.
8. Fundamentals of Business Analytics by R N Prasad and SeemaAcharya, Wiley India.
9. Business Intelligence: The Savvy Manager's Guide by David Loshin, Latest Edition By Knowledge Enterprise.
10. Business Intelligence roadmap by Larissa Terpeluk Moss and ShakuAtre, Addison Weseley.
11. Successful Business Intelligence: Secrets to making Killer BI Applications by CindiHowson, Tata McGraw Hill.
12. Business intelligence for the enterprise by Mike Biere, Addison Weseley.

**Subject Name:**  **Advanced Computer Networks**

**Paper Code: MEIT 316**  Max. Marks: 50  Time: 3 hours
**Course Duration**: 45 lectures of one hour each.

**Note:** The examiner shall set seven questions of 10 marks each. First question has to be compulsory, having parts covering the whole syllabus. Three questions have to be set from Part A and three questions from Part B of the syllabus. Candidate is required to attempt at least two questions from each part. All the course outcomes must be covered by the question paper.

## Part A
**INTRODUCTION**  (5)
Overview of computer networks, seven-layer architecture, TCP/IP suite of protocols, etc.

**MEDIUMACCESS**  (5)
MAC protocols for high-speed LANS, MANs, and wireless LANs. (For example, FDDI, DQDB, HIPPI, Gigabit Ethernet, Wireless ethernet, etc.)

**INTERNETWORKING AND ROUTING**  (7)
Packet Switching, The Internetworking Problem, The IP/TCP split connections, Scaling IP, Routers: Forwarding and Routing, The IP forwarding path, Unicast Internet routing: Intra and Inter domain routing, Router Design and Implementation, Security problems with Internet Architecture, IPV6.

**RESOURCE MANAGEMENT**  (6)
End-to-End Congestion Control, Router-Assisted Congestion Control: Active Queue Management, Fair Queuing and Variants, Modeling and Measurement: Packet Trains, TCP Congestion Control Impediments, Adaptive Network Applications.

## Part B
**QUALITY OF SERVICE (QOS)**  (4)
Why QoS; Basic Models and Architecture, Mechanisms and Properties, Modeling and Measurement: Traffic Self-Similarity; Virus Propagation.

**GROUP COMMUNICATION**  (5)
Multicast Routing and Transport, IP Multicasting: Multicast routing protocols, address assignments, session discovery etc., Multicasting in mobile networks.

**TRANSPORT LAYER PROTOCOL**  (5)
TCP protocol dynamics, TCP extensions for high-speed networks, transaction-oriented applications. Other new options in TCP.

**WIRELESS NETWORKS**  (3)
Wireless LAN architecture, Mobile IP, Broadcast file system, Agent technology, Satellite technology.

## SECURITY (5)

Network security at various layers. Secure-HTTP, SSL, ESP, Authentication header, Key distribution protocols. Digital signatures, digital certificates.

## BOOKS:

Andrew Tanenbaum. Computer Networks, PHI

## REFERENCES:

1. W. R. Stevens. TCP/IP Illustrated, Volume 1: The protocols, Addison Wesley, 1994.
2. G. R. Wright. TCP/IP Illustrated, Volume 2: The Implementation, Addison Wesley, 1995.
3. W. R. Stevens. TCP/IP Illustrated, Volume 3: TCP for Transactions, HTTP, NNTP, and the Unix Domain Protocols, Addison Wesley, 1996.
4. R. Handel, M. N. Huber, and S. Schroeder. ATM Networks: Concepts, Protocols, Applications, Addison Wesley, 1998.
5. W. Stallings. Cryptography and Network Security: Principles and Practice, 2nd Ed., Prentice Hall, 1998.
6  CE Perkins, B. Woolf, and S. R. Alpert. Mobile IP: Design Principles and Practices, Addison Wesley, 1997.