

# **Programme: M.Tech**

**Computer Science & Engineering**

## **Scheme and Syllabi**

**w.e.f. Academic Session 2020-21**



# **BUEST**

**SCHOOL OF ENGINEERING & EMERGING TECHNOLOGIES**

**SEMESTER – I**

Sr.No	Code	Course Title	L	T	P	Credit
1	PCS101	Advanced Computer Architecture	4	0	0	4
2	PCS102	Advanced Database Management System	4	0	0	4
3	PCS103	Advanced Operating System	4	0	0	4
4	PCS104	Advanced Data Structures and Algorithms	4	0	0	4
5	PCS105	Advanced Computer Networks	4	0	0	4
6	PCS106	Advanced Database Management System Lab	0	0	4	2
7	PCS107	Advanced Data Structure and Algorithm Lab	0	0	4	2
<b>Total</b>			20	0	8	24

**Total Hours: 28****SEMESTER – II**

Sr.No	Code	Course Title	L	T	P	Credit
1	PCS152	Soft Computing	4	0	0	4
2	PCS153	Information Security	4	0	0	4
3	PCS154	Computer Vision and Image Processing	4	0	0	4
4	PMG151	Research Methodology	4	0	0	4
5	PCS155	Soft Computing Lab	0	0	4	2
6	PCS157	Machine Learning	4	0	0	4
7	PCS156	PROJECT-I	0	0	4	2
<b>Total</b>			20	0	8	24

**Total Hours: 28****Semester – III**

Sr.No	Code	Course Title	L	T	P	Credit
1	PCS201	Big Data Analytics	4	0	0	4
2	PCSXXX	Elective I	4	0	0	4
3	PCSXXX	Elective II	4	0	0	4
4	PCS204	Seminar	0	0	4	2
5	PCS205	Pre-thesis	0	0	8	4
<b>Total</b>			12	0	12	18

**Total Hours:24****Elective –I**

Sr.No	Code	Course Title	L	T	P	Credit
1	PCS206	Natural Language Processing	4	0	0	4
2	PCS207	Cloud Computing	4	0	0	4
3	PCS208	Software Testing and Quality Management	4	0	0	4
4	PCS209	Software Verification Validation And Testing	4	0	0	4
5	PCS210	Agile Software Development	4	0	0	4

**Elective –II**

<b>Sr.No</b>	<b>Code</b>	<b>Course Title</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Credit</b>
1	PCS211	Optimization Techniques	4	0	0	4
2	PCS212	Distributed Operating System	4	0	0	4
3	PCS213	Object Oriented Analysis and Design using UML	4	0	0	4
4	PCS214	Advanced Artificial Intelligence	4	0	0	4
5	PCS215	Business Intelligence	4	0	0	4

**SEMESTER –IV**

<b>Sr.No</b>	<b>Code</b>	<b>Course Title</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Credit</b>
1	PCS260	Dissertation/ Thesis	<b>0</b>	<b>0</b>	<b>0</b>	16

# **SEMESTER I**

**Note for End Term Examination:** Attempt five questions in all, selecting one question each from the sections A, B, C and D. Section E is compulsory.

**Course Name :- Advanced Computer Architecture**

**Course Code:- PCS101**

<b>Assessment and Evaluation Components</b>	
Quizzes /Assignments/ Presentation/Class Test/ Open Book Test/ Case Study	25
Mid Term Tests (MTE)	20
Attendance Marks	05
End Term Examination	50
<b>Total</b>	<b>100</b>

**L T P Cr**  
**4 0 0 4**

### UNIT-1

**Parallel Computer Models:** The state of computing, Classification of parallel computers, Multiprocessors and multicomputers, Multivector and SIMD computers.

**Program and Network Properties:** Conditions of parallelism, Data and resource Dependences, Hardware and software parallelism, Program partitioning and scheduling, Grain Size and latency, Program flow mechanisms, Control flow versus data flow, Data flow Architecture, Demand driven mechanisms, Comparisons of flow mechanisms.

### UNIT-2

**System Interconnect Architectures:** Network properties and routing, Static interconnection Networks, Dynamic interconnection Networks, Multiprocessor system Interconnects, Hierarchical bus systems, Crossbar switch and multiport memory, Multistage and combining network.

**Advanced Processors:** Advanced processor technology, Instruction-set Architectures, CISC Scalar Processors, RISC Scalar Processors, Superscalar Processors, VLIW Architectures, Vector and Symbolic processors

### UNIT-3

**Memory Hierarchy Design:** Inclusion, coherence & locality; memory capacity planning; Cache basics & cache performance, cache addressing models & mapping, multilevel cache hierarchies, interleaved memory.

**Pipelining:** Linear pipeline processor, nonlinear pipeline processor, Collision free scheduling, Instruction pipeline Design, Mechanisms for instruction pipelining, Dynamic instruction scheduling, Branch Handling techniques, Arithmetic Pipeline Design, Computer arithmetic principles, Static Arithmetic pipeline, Multifunctional arithmetic pipelines

### UNIT-4

**Multiprocessor Architectures:** Symmetric shared memory architectures, distributed shared memory architectures, models of memory consistency, cache coherence problem, Snoopy cache coherence protocol, directory-based protocols, design challenges of directory protocols, memory based directory protocols, cache based directory protocols, protocol design tradeoffs, synchronization.

**Note for End Term Examination:** Attempt five questions in all, selecting one question each from the sections A, B, C and D. Section E is compulsory.

**Multicomputer Architectures:** Message passing mechanisms – message routing schemes, deadlock and virtual channels, flow control strategies, multicast routing algorithms.

**Text Books:**

1. Kai Hwang, “Advanced Computer Architecture”; TMH, 1993.
2. D.Sima, T.Fountain, P.Kasuk, “Advanced Computer Architecture-A Design space Approach,” Addison Wesley, 1997.

**Reference Books:**

1. M.J Flynn, “Computer Architecture, Pipelined and Parallel Processor Design”; Narosa Publishing, 1998
2. D. A. Patterson and J. L. Hennessey, “Computer organization and design,” Morgan Kaufmann, 2002.
3. J.P.Hayes, “Computer Architecture and Organization”; MGH, 1998.
4. Harvey G. Cragon, ”Memory System and Pipelined processors”; Narosa Publication, 1998.
5. V.Rajaraman & C.S.R.Murthy, “Parallel computer: Architecture & Programming”, PHI, 2004.
6. Carl Hamacher, Zvonko Vranesic, Safwat Zaky, “Computer Organization”, 5<sup>th</sup> Edition, MGH, 2002
7. Kai Hwang and Zu, “Scalable Parallel computing”; MGH, 1998.

**Note for End Term Examination:** Attempt five questions in all, selecting one question each from the sections A, B, C and D. Section E is compulsory.

**Course Name: - Advanced Database Management System****Course Code: - PCS102**

<b>Assessment and Evaluation Components</b>	
Quizzes /Assignments/ Presentation/Class Test/ Open Book Test/ Case Study	25
Mid Term Tests (MTE)	20
Attendance Marks	05
End Term Examination	50
<b>Total</b>	<b>100</b>

**L T P Cr**  
**4 0 0 4**

**UNIT-1**

**Introduction:** Database system concepts, Three-level Schema Model, Data Independence, Relational model concepts, Relational Database Design: Dependencies, Normalization.

**UNIT-2**

**The Enhanced Entity-Relationship Model and Object-Oriented Database:** The ER model revisited, EER model: Subclasses, Super classes, Inheritance, Specialization and Generalization, Constraints and characteristics of specialization and Generalization; Object Model: Overview of Object-Oriented concepts, Object identity, Object structure, Type constructors, Encapsulation of operations, Methods, and Persistence, Type hierarchies and Inheritance.

**UNIT-3**

**Parallel and Distributed Databases and Client-Server Architecture:** Design of Parallel Databases, Parallel Query Evaluation., Distributed database concepts, Distributed Data Storage – Fragmentation & Replication, Location and Fragment, Transparency Distributed Query Processing and Optimization, Distributed Transaction, Modeling and concurrency Control, Distributed Deadlock, and Commit Protocols.

**UNIT-4**

**Enhanced Data Models for Advanced Applications:** Active database concepts, Temporal database concepts, Spatial databases, Deductive databases; Emerging Database Technologies: Mobile databases, Multimedia Databases, Geographic information systems (GIS); XML and Internet Databases: Structured, Semi-structured and Unstructured Data, Introduction to web databases and XML, Structure of XML data.

**Text Books:**

1. Elmasri and Navathe, Fundamentals of Database Systems [5e], Pearson Education.
2. Korth, Silberchatz, Sudarshan, Database System Concepts[5e], McGraw-Hill.
3. Raghuram Ramakrishnan, Johannes Gehrke, Database Management Systems, McGraw- Hill
4. Peter Rob and Coronel, Database Systems, Design, Implementation and Management, Thomson Learning.

**Note for End Term Examination:** Attempt five questions in all, selecting one question each from the sections A, B, C and D. Section E is compulsory.

5. C.J.Date, Longman, Introduction to Database Systems, Pearson Education
6. Thomas Connolly, Carolyn Begg, Database Systems, [3e], Pearson Education

**Reference Books:**

1. Garcia, Ullman, Widom, "Database Systems, The complete book", Pearson Education, 2007
2. R. Ramakrishnan, "Database Management Systems", McGraw Hill International Editions, 1998
3. Singh S.K., "Database System Concepts, design and application", Pearson Education, 2006.
4. W. Kim, "Modern Database Systems", 1995, ACM Press, Addison – Wesley.
5. D. Maier, "The Theory of Relational Databases", 1993, Computer Science Press, Rokville, Maryland.
6. Ullman, J. D., "Principals of database systems", Galgotia publications, 1999.
7. Oracle Xi Reference Manual.
8. Dietrich, and Urban, "An Advanced Course in Database Systems", Pearson, 2008.



**Course Name: - Advanced Operating System****Course Code: - PCS 103**

<b>Assessment and Evaluation Components</b>	
Quizzes /Assignments/ Presentation/Class Test/ Open Book Test/ Case Study	25
Mid Term Tests (MTE)	20
Attendance Marks	05
End Term Examination	50
<b>Total</b>	<b>100</b>

**L T P Cr****4 0 0 4****UNIT-1**

**Introduction:** Functions of Operating system, Design approaches, need of advanced operating systems, Types of advanced operating systems, Synchronization mechanisms.

**Multiprocessor operating system:** Multiprocessor operating system, Multiprocessor system architecture, Processor scheduling and allocation, Memory Management. Process synchronization in multiprocessing/ multiprogramming systems, Inter-process communication and co-ordination.

**UNIT-2**

**Distributed operating system:** Distributed operating system characteristics, Network Structure, Communication: structure and Protocols, Design Issues.

**Distributed File System:** Naming and transparency, Remote File Access, File Replication, Stateful vs Stateless Service.

**UNIT-3**

**Distributed Synchronization:** Event Ordering, Mutual Exclusion, Atomicity, Concurrency Control, Deadlock Handling, Election Algorithms.

**UNIT-4**

**Real Time Operating System:** Scheduling mechanisms, Interrupts, Memory management, I/O & networking, Features of Real time Kernels. Multi threading, Super threading and Hyper threading.

**Case studies:** Case studies of contemporary operating systems, Open source software, LINUX, Mini OS.

**Text Books:**

1. M Singhal and NG Sivaratri, Advanced Concepts in Operating Systems, Tata McGraw, Hill Inc., 2001.
2. Silberschatz and P. Galvin, Operating System Concepts, VI edition, Addison Wesley 2004.

**Reference Books:**

1. A.S. Tanenbaum, Distributed Operating System, Pearson Education Asia, 2001.
2. A. S. Tanenbaum and M. V. Steen, Distributed Systems – Principles and Paradigms, Second

**Note for End Term Examination:** Attempt five questions in all, selecting one question each from the sections A, B, C and D. Section E is compulsory.

Edition, Pearson Prentice Hall, 2007.

3. Modern Operating Systems by A. Tanenbaum, 1992, Prentice-Hall.

4. Operating Systems Internals and Design Principles by William Stallings, 4 ed., 2001, Prentice-Hall.

**Course Name: - Advanced Data Structures and Algorithms**

**Course Code :- PCS104**

<b>Assessment and Evaluation Components</b>	
Quizzes /Assignments/ Presentation/Class Test/ Open Book Test/ Case Study	25
Mid Term Tests (MTE)	20
Attendance Marks	05
End Term Examination	50
<b>Total</b>	<b>100</b>

**L T P Cr**  
**4 0 0 4**

### UNIT-1

**Review of Elementary Data Structures:** Arrays, linked lists, stacks, queues, trees, graphs, sorting & searching techniques.

**Threaded Trees:** Properties of threaded trees, insertion, deletion and traversal.

**AVL Trees:** Properties of AVL trees, rotations, insertion and deletion.

**B-Trees:** Definition of B-trees, basic operations on B-trees, deleting a key from a B-tree.

**Heaps:** Properties of Min-max heaps, building a heap, basic operations on heaps.

### UNIT-2

**Introduction to Algorithms:** The notation of algorithm, fundamentals of algorithmic problem solving, analyzing algorithms, Algorithms and their complexity, Performance analysis: - Time and space complexity, asymptotic notation. Analyzing recursive algorithms using recurrence relations: Substitution method, Recursion-tree method, Master method.

**Divide and Conquer, and Greedy Algorithm Design Methodologies:** General Methods, Quick sort ,Merger Sort , Binary Search, Knapsack Problem , Minimum spanning tree, Single source shortest path problem.

**Branch-and-Bound, and Lower Bound Theory:** Introduction, 0-1 knapsack problem, Traveling salesman problem, comparison trees for sorting, searching and merging.

### UNIT-3

**Dynamic Programming and Backtracking Algorithm Design Methodologies:** Introduction, Traveling salesperson problem, 0/1 Knapsack problem, multistage graphs, All Pair Shortest Path, 8-Queens problem

**Advanced String Matching Algorithms:** Naïve string matching algorithm, Robin-Karp algorithm, string matching with finite automata, Knuth-Morris-Pratt algorithm.

### UNIT-4

**P, NP and Approximation Algorithms:** Basic Concepts, Non Deterministic algorithms, NP Complete and NP-hard classes, NP complete Problems.

### Text Books:

1. Horowitz Ellis And Sartaj Sahni “Fundamentals of Computer Algorithms”.

**Note for End Term Examination:** Attempt five questions in all, selecting one question each from the sections A, B, C and D. Section E is compulsory.

**Reference Books:**

1. Cormen, Leiserson, Rivest and Stein “Introduction to Algorithms”, Prentice-Hall of INDIA.
2. Aho-Hopcroft and Ullman “The Design and Analysis of Computer Algorithms”.

**Course Name: - Advanced Computer Networks**  
**Course Code :- PCS105**

<b>Assessment and Evaluation Components</b>	
Quizzes /Assignments/ Presentation/Class Test/ Open Book Test/ Case Study	25
Mid Term Tests (MTE)	20
Attendance Marks	05
End Term Examination	50
<b>Total</b>	<b>100</b>

**L T P Cr**  
**4 0 0 4**

### Unit-1

**Introduction:** Overview of Computer Networks, seven-layer architecture, ISO-OSI and TCP/IP reference models, MAC protocols for high-speed LAN, MAN, WAN and wireless LAN : Gigabit Ethernet, ISDN, HIPPI, ATM, SMDS, SONET, ADSL 7

**IPv6:** Basic protocol, extensions and options, support for QoS, security, neighbor discovery, auto-configuration, routing, Application Programming Interface for IPv6.

### UNIT-2

**Flow and Congestion Control:** Window and Rate Based Schemes, ABR, hop-by-hop schemes.

**Quality of Service:** Quality of Service in ATM, IETF integrated services model, Differentiated Services Model. Flow identification, Packet Classifiers and Filters, Scheduling.

**Network Management:** ASN, SNMP, CMIP.

### UNIT-3

**Mobility in networks:** Mobile IP and related issues like Route Optimization, Handoff, and Security. Mobility support for IPv6.

**Transport Layer:** TCP extensions for high-speed networks, transaction-oriented applications. Other new options in TCP. TCP in Wireless Domain.

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

### UNIT-4

**Overview of wireless networks:** Introduction to wireless communication, architecture of wireless networks – 802.11, 2G, 3G, WLL, Wireless ATM, 802.16 and 802.20.

**Mobile Ad hoc Networks (MANETs):** Introduction to Ad hoc wireless networks and sensor networks, applications of Ad hoc networks.

### Text Books:

1. W. R. Stevens “TCP/IP Illustrated, Volume 1: The protocols”, Addison Wesley
2. W. Stallings “Cryptography and Network Security: Principles and Practice, 2<sup>nd</sup> Edition, Pearson Education
3. Michael A. Gallo and William M. Hancock : Computer Communications and Networking Technologies, Thomson Brooks / Cole

**Note for End Term Examination:** Attempt five questions in all, selecting one question each from the sections A, B, C and D. Section E is compulsory.

4. M. Gonsalves and K. Niles : IPv6 Networks, McGraw Hill
5. William Stallings C. Siva Ram Murthy and B. S Manoj :Wireless Communication and Networks, Prentice Hall.
6. Adhoc Wireless Networks – Architecture and Protocols, Prentice Hall.
7. Computer Networks by Tenenbaum (3rd edition)
8. Data Communication and Networking by FORAUZAN.

**Reference Books:**

1. C. E. Perkins, B. Woolf, and S. R. Alpert : Mobile IP: Design Principles and Practices, Addison Wesley
2. S. Keshav : An Engineering Approach to Computer Networking, Pearson Education
3. Demorais and D. P Aggarwal :Adhoc Networks – Theory and Applications, World Scientific Publications
4. Jochen Schiller : Mobile Communication, Pearson Education

**Course Name: - Advanced Database Management System Lab****Course Code :- PCS106**

<b>Evaluation Components for Practical Courses (Students are required to perform atleast 8 practicals mandatorily from the given list of practicals)</b>	
Lab Performance	10
Lab file work	10
Viva – Voce	10
<b>Total</b>	<b>30</b>

**L T P Cr**  
**0 0 4 2**

1. Perform queries for DCL Commands and Locks
2. Implement authorization, authentication, and privileges on database
3. Perform queries to Create synonyms, sequence and index
4. Perform queries to Create, alter and update views
5. Implement PL/SQL programs using control structures
6. Implement PL/SQL programs using Cursors
7. Implement PL/SQL programs using exception handling.
8. Implement user defined procedures and functions using PL/SQL blocks
9. Perform various operations on packages.
10. Implement various triggers
11. Practice on functional dependencies
12. Practices on Normalization – using any database perform various normal forms.
13. Practice on transaction processing

**Note for End Term Examination:** Attempt five questions in all, selecting one question each from the sections A, B, C and D. Section E is compulsory.

**Course Name: - Advanced Data Structure and Algorithm Lab****Course Code :- PCS-107**

<b>Evaluation Components for Practical Courses (Students are required to perform atleast 8 practicals mandatorily from the given list of practicals)</b>	
Lab Performance	10
Lab file work	10
Viva – Voce	10
<b>Total</b>	<b>30</b>

**L T P Cr**  
**0 0 4 2**

1. Write a program to implement Queue.
2. Write a program to implement Stack.
3. Write a program to create a linked list & perform operations such as a) Add a node b) Delete a node c) Update a node
4. Write a program to simulate the various searching algorithms and compare their timings for a list of 50 elements.
5. Write a program to simulate the various sorting algorithms and compare their timings for a list of 50 elements.
6. Write a program to implement binary search tree. ( Insertion and Deletion in Binary search Tree)
7. Write a program to implement AVL Trees. ( Insertion and Deletion in AVL Trees)
8. Write a program to implement Threaded Trees. ( Insertion and Deletion in Threaded Trees)
9. Write a program to simulate the various graph traversing algorithms.
10. Write a program which simulates the various tree traversal algorithms.
11. Write a program to simulate divide and Conquer Method.
12. Write a program to simulate Greedy Method.
13. Write a program to simulate Dynamic Programming Method.
14. Write a program to simulate Backtracking method.

**Note for End Term Examination:** Attempt five questions in all, selecting one question each from the sections A, B, C and D. Section E is compulsory.



## **SEMESTER II**

**Note for End Term Examination:** Attempt five questions in all, selecting one question each from the sections A, B, C and D. Section E is compulsory.

**Course Name :- Soft Computing**

**Course Code: - PCS152**

<b>Assessment and Evaluation Components</b>	
Quizzes /Assignments/ Presentation/Class Test/ Open Book Test/ Case Study	25
Mid Term Tests (MTE)	20
Attendance Marks	05
End Term Examination	50
<b>Total</b>	<b>100</b>

**L T P Cr**  
**4 0 0 4**

### UNIT-1

**Soft Computing:** An introduction, Components of soft computing, goals of soft computing.

**Artificial Neural Network:** An introduction, ANN architecture, Supervised Learning Network: Perceptron Networks, Adaptive Linear Neuron, Multiple Adaptive Linear Neuron, Back Propagation Network and other networks, Associative memory networks, Unsupervised Learning Networks.

### UNIT-2

**Fuzzy Logic:** Introduction to Fuzzy logic, Classical Sets and Fuzzy Sets, Classical Relations and Fuzzy Relations, Membership functions, Defuzzification, Fuzzy Arithmetic and Fuzzy measures, Fuzzy Rule base and approximate reasoning, Fuzzy decision making.

### UNIT-3

**Genetic Algorithm:** An introduction, Evolutionary computation. Survival of the Fittest - Fitness Computations - Cross over –Mutation, Reproduction - Rank method - Rank space method.

### UNIT-4

**Hybrid Soft Computing Techniques:** An Introduction, Neuro-Fuzzy Hybrid Systems, Genetic Neuro-Hybrid systems, Genetic fuzzy Hybrid and fuzzy genetic hybrid systems.

### Text Books:

1. Sivanandam and S. N. Deepa, “Principals of Soft Computing” Wiley Publication.
2. S. Rajasekaran, G. A. Vijayalakshmi “Neural networks, fuzzy logic and genetic algorithm: synthesis and applications” PHI.

### Reference Books:

1. Samir Roy and Udit Chakraborty “Introduction to Soft Computing” Pearson.

**Note for End Term Examination:** Attempt five questions in all, selecting one question each from the sections A, B, C and D. Section E is compulsory.

**Course Name :- Information Security**  
**Course Code: - PCS153**

<b>Assessment and Evaluation Components</b>	
Quizzes /Assignments/ Presentation/Class Test/ Open Book Test/ Case Study	25
Mid Term Tests (MTE)	20
Attendance Marks	05
End Term Examination	50
<b>Total</b>	<b>100</b>

**L T P Cr**  
**4 0 0 4**

**UNIT-1**

**Overview:** Computer Security Concepts, Requirements, Architecture, Trends, Strategy, Edge/boundary Security: Firewalls, Intrusion Detection, Intrusion Prevention systems, Honeypots.

**UNIT-2**

**User Authentication:** Password, Password-based authentication, token based authentication, Biometric authentication, Remote User authentication.

**Access Control:** Principles, Access Rights, Discretionary Access Control, Unix File Access Control, Role Based Access Control Internet.

**Authentication Applications:** Kerberos, X.509, PKI, Federated Identity Management.

**UNIT-3**

**Cryptographic Tools:** Confidentiality with symmetric encryption, Message Authentication & Hash Functions, Digital Signatures, Random and pseudorandom Numbers, Symmetric Encryption.

**Message Confidentiality:** DES, AES, Stream Ciphers, Cipher Block Modes of Operation, Key Distribution.

**Internet Security Protocols:** SSL, TLS, IPSEC, S/ MIME.

**UNIT-4**

**Database Security:** The Need for Database Security, Database Management Systems, Relational Databases, Database Access Control, Inference, Statistical Databases, Database Encryption, Cloud Security.

**Malicious Software:** Types of Malicious Software (Malware), Propagation–Infected Content Viruses, Propagation–Vulnerability Exploit–Worms, Propagation–Social Engineering–SPAM E mail, Trojans, Payload–System Corruption, Payload–Attack Agent–Zombie, Bots, Payload Information Theft–Keyloggers, Phishing, Spyware, Payload–Stealth–Backdoors, Rootkits.

**Text Books:**

1. Computer Security: Principles and Practice, William Stalling & Lawrie Brown, 2008, Indian Edition 2010, Pearson
2. Chuck Easttom, “Computer Security Fundamentals” Pearson, 2011

**Note for End Term Examination:** Attempt five questions in all, selecting one question each from the sections A, B, C and D. Section E is compulsory.

**Reference Books:**

1. M. Stamp, "Information Security: Principles and Practice," 2nd Edition, Wiley, ISBN: 0470626399, 2011.
2. M. E. Whitman and H. J. Mattord, "Principles of Information Security," 4th Edition, Course Technology, ISBN: 1111138214, 2011.
3. M. Bishop, "Computer Security: Art and Science," Addison Wesley, ISBN: 0-201-44099-7, 2002

**Course Name :- Computer Vision and Image Processing**  
**Course Code: - PCS154**

<b>Assessment and Evaluation Components</b>	
Quizzes /Assignments/ Presentation/Class Test/ Open Book Test/ Case Study	25
Mid Term Tests (MTE)	20
Attendance Marks	05
End Term Examination	50
<b>Total</b>	<b>100</b>

**L T P Cr**  
**4 0 0 4**

**UNIT-1**

**Introduction :** Vision goals, Geometric Camera models and calibrations, Radiometry, intensity, brightness, contrast, color image representation, color models, Imaging Devices.

**Low Level Processing:** Intensity transform functions, histogram processing, Spatial filtering, Fourier transforms and its properties, Walsh transform, Hotelling transforms, Haar and slant transforms, Hadamard transforms, frequency domain filters, Homomorphic Filtering, Pseudo coloring, color transforms.

**UNIT-2**

**Image Segmentation:** Point, Line and Edge Detection, Thresholding, Edge and Boundary linking, Hough transforms, Region Based Segmentation.

**Image Compression:** Image compression models, reversible compression, irreversible compression.

**Wavelets:** wavelet functions, wavelet transformations in one and two dimensions, fast wavelet transform.

**UNIT-3**

**Early Vision:** The Geometry of Multiple Views, Stereopsis, Affine Structure from Motion, Projective Structure from Motion.

**Mid Level Vision:** Segmentation By Clustering, Segmentation By Fitting a Model, Segmentation and Fitting Using Probabilistic Methods, Tracking with Linear Dynamic Models.

**UNIT-4**

**Image Representation & Descriptions:** Boundary representations, Region Representations, shape properties, Boundary Descriptors, Regional Descriptors, Texture representations, Object Descriptions.

**Three Dimensional Image Processing:** Computerized Axial Tomography-Stereometry-Stereoscopic Image Display-Shaded Surface Display.

**Text Books:**

1. Rafael C. Gonzalez, Richard E. Woods “Digital Image Processing”, Pearson Education.

**Note for End Term Examination:** Attempt five questions in all, selecting one question each from the sections A, B, C and D. Section E is compulsory.

2. Forsyth and Ponce “Computer Vision A Modern Approach”, Pearson Education.

**Reference Books:**

1. William K. Pratt, “Digital Image Processing”, John Wiley & Sons.
2. B.Chanda, D. Dutta Majumder, “Digital Image Processing and Analysis”, PHI.
3. A.K. Jain, “Fundamental of Digital Image Processing”, PHI.
4. Millman Sonka, Vaclav Hlavac, “Image Processing Analysis and Machine vision”, Thompson Learning.
5. Trucco & Verri “Introductory Techniques for 3-D Computer Vision”, Prentice Hall, Latest Edition.

**Course Name :- Research Methodology**  
**Course Code: - PMG-151**

<b>Assessment and Evaluation Components</b>	
Quizzes /Assignments/ Presentation/Class Test/ Open Book Test/ Case Study	25
Mid Term Tests (MTE)	20
Attendance Marks	05
End Term Examination	50
<b>Total</b>	<b>100</b>

**L T P Cr**  
**4 0 0 4**

**UNIT-1**

**Research Concepts:** Concepts, meaning, objectives, motivation, types of research, approaches, research (Descriptive research, Conceptual, Theoretical, and Applied & Experimental).

**Formulation of Research Task:** Literature Review, Importance & Methods, Sources, quantification of Cause Effect Relations, Discussions.

**Field Study:** Critical Analysis of Generated Facts, Selection of Research task

**UNIT-2**

**Statistical Methods of Analysis:** Descriptive statistics: Meaning, graphical representations, mean, range and standard deviation.

**Characteristics and uses of normal curve Inferential statistics:** Parametric tests of Hypothesis, t-test, z-test.

**Chi-square tests,** correlation & Regression, ANOVA (one way,two way), Latin Squares

**UNIT-3**

**Design of experiment:** Definition of Experimental Design, Examples,

**Design:** Design using Orthogonal arrays, Taguchi's robust parameter design

**UNIT-4**

**Report Writing:** Types of reports, layout of research report, interpretation of results, style manual,

**Layout and Format:** style of writing, typing, references, tables, figures, conclusion, appendices

**Text Books:**

1. Research Methodology: C. R. Kothari, New Age Publishers, 2005
2. Formulation of Hypothesis: Wilkinson K. L, Bandera P. L, Himalaya Publication.
3. Theories of Engineering Experiments: Schank Fr. Tata Mc Graw Hill Publication.

**Reference Books:**

1. Research in Education: John W. Besr and James V. Kahn, PHI Publication.
2. Design of Experiments: Douglas Montgomery, Statistical Consulting Services, 1990.

**Note for End Term Examination:** Attempt five questions in all, selecting one question each from the sections A, B, C and D. Section E is compulsory.

**Course Name: - Soft Computing Lab****Course Code :- PCS-155**

<b>Evaluation Components for Practical Courses (Students are required to perform atleast 8 practicals mandatorily from the given list of practicals)</b>	
Lab Performance	10
Lab file work	10
Viva – Voce	10
<b>Total</b>	<b>30</b>

**L T P Cr**  
**0 0 4 2**

1. Implement OR, AND Using Perceptron.
2. Study and Analysis of Fuzzy Vs Crisp Logic.
3. Write a program of Perceptron Training Algorithm.
4. Write a program to Implement Hebb's Rule
5. Write a program to Implement of Delta Rule
6. Write a program for Back Propagation Algorithm.
7. Study and implementation of Genetic Algorithms.
8. Write a program to solve TSP (Travelling Salesman Problem) using genetic algorithm.

**Note for End Term Examination:** Attempt five questions in all, selecting one question each from the sections A, B, C and D. Section E is compulsory.



**Course Name :- Machine Learning**  
**Course Code: - PCS-157**

<b>Assessment and Evaluation Components</b>	
Quizzes /Assignments/ Presentation/Class Test/ Open Book Test/ Case Study	25
Mid Term Tests (MTE)	20
Attendance Marks	05
End Term Examination	50
<b>Total</b>	<b>100</b>

**L T P Cr**  
**4 0 0 4**

**UNIT-1****Introduction to Machine Learning**

Examples of Machine Learning Problems, Structure of Learning, Learning versus Designing, Training versus Testing, Characteristics of Machine learning tasks, Predictive and descriptive tasks, Machine learning Models: Geometric Models, Logical Models, Probabilistic Models. Features: Feature types, Feature Construction and Transformation, Feature Selection.

**UNIT-2****Classification And Regression**

Classification: Binary Classification- Assessing Classification performance, Class probability Estimation- Assessing class probability Estimates, Multiclass Classification.

Regression: Assessing performance of Regression- Error measures, Overfitting- Catalysts for Overfitting, Case study of Polynomial Regression. Theory of Generalization: Effective number of hypothesis, Bounding the Growth function, VC Dimensions, Regularization theory

**Linear Models**

Least Squares method, Multivariate Linear Regression, Regularized Regression, Using Least Square regression for Classification. Perceptron, Support Vector Machines, Soft Margin SVM, Obtaining probabilities from Linear classifiers, Kernel methods for non-Linearity.

**UNIT-3****Logic Based And Algebraic Models**

Distance Based Models: Neighbours and Examples, Nearest Neighbours Classification, Distance based clustering-K means Algorithm, Hierarchical clustering, Rule Based Models: Rule learning for subgroup discovery, Association rule mining. Tree Based Models: Decision Trees, Ranking and Probability estimation Trees, Regression trees, Clustering Trees.

**UNIT-4****Probabilistic Models**

Normal Distribution and Its Geometric Interpretations, Naïve Bayes Classifier, Discriminative learning with Maximum likelihood, Probabilistic Models with Hidden variables: Estimation-Maximization Methods, Gaussian Mixtures, and Compression based Models.

**Note for End Term Examination:** Attempt five questions in all, selecting one question each from the sections A, B, C and D. Section E is compulsory.

**Trends In Machine Learning**

Model and Symbols- Bagging and Boosting, Multitask learning, Online learning and Sequence Prediction, Data Streams and Active Learning, Deep Learning, Reinforcement Learning.

**Text Books:**

1. Introduction to Machine Learning by EthemAlpaydin PHI.
2. Machine Learning: The Art and Science of Algorithms that Make Sense of Data Peter Flach Cambridge University Press, 2012.

**Note for End Term Examination:** Attempt five questions in all, selecting one question each from the sections A, B, C and D. Section E is compulsory.

## **SEMESTER III**

**Note for End Term Examination:** Attempt five questions in all, selecting one question each from the sections A, B, C and D. Section E is compulsory.

**Course Name :- Big Data Analytics**  
**Course Code: - PCS201**

<b>Assessment and Evaluation Components</b>	
Quizzes /Assignments/ Presentation/Class Test/ Open Book Test/ Case Study	25
Mid Term Tests (MTE)	20
Attendance Marks	05
End Term Examination	50
<b>Total</b>	<b>100</b>

**L T P Cr**  
**4 0 0 4**

**UNIT-1**

An Overview of Big Data and Big Data Analytics. Understanding Hadoop Ecosystem (Hadoop Distributed File System, MapReduce, Hadoop YARN, HBase, Combining HBase and HDFS, Hive, Pig, Sqoop, ZooKeeper, Flume, Oozie). MapReduce Framework, Techniques to Optimize MapReduce Jobs, Role of HBase in Big Data Processing.

**UNIT-2**

Developing Simple MapReduce Application, Points to Consider while Designing MapReduce. Controlling MapReduce Execution with InputFormat, Reading Data with Custom RecordReader, Organizing Output Data with Output Formats, Customizing Data with RecordWriter, Optimizing MapReduce Execution with Combiner, Controlling Reducer Execution with Partitioners.

**UNIT-3**

YARN Architecture, Working of YARN, YARN Schedulers, Backward Compatibility with YARN, YARN Configurations, YARN Commands, YARN Containers. Introduction to NoSQL. Types of NoSQL Data Models, Schema-Less Databases, Materialized Views, Distribution Models.

**UNIT-4**

Analytical Approaches, Introducing to various Analytical Tools, Installing R, Handling Basic Expressions in R, Variables in R, Working with Vectors, Storing and Calculating Values in R, Creating and Using Objects, Interacting with Users, Handling Data in R Workspace, Executing Scripts, Reading Datasets and Exporting Data from R, Manipulating and Processing Data in R, Working with Functions and Packages in R, Performing Graphical Analysis in R, Techniques Used for Visual Data Representation, Types of Data Visualization.

**Text Books:**

1. Big Data, Black Book by DT Editorial Services, Dreamtech Press.
2. Yu Wang, Hui Xiong, Shlomo Argamon, XiangYang Li, JianZhong Li Springer “Big Data Computing and Communications”.

**Reference Book:**

1. Vijay Srinivas Agneeswaran, “Big Data Analytics Beyond Hadoop” FT Press.

**Note for End Term Examination:** Attempt five questions in all, selecting one question each from the sections A, B, C and D. Section E is compulsory.

# ELECTIVE I

**Note for End Term Examination:** Attempt five questions in all, selecting one question each from the sections A, B, C and D. Section E is compulsory.

**Course Name :- Natural Language Processing**  
**Course Code: - PCS-206**

<b>Assessment and Evaluation Components</b>	
Quizzes /Assignments/ Presentation/Class Test/ Open Book Test/ Case Study	25
Mid Term Tests (MTE)	20
Attendance Marks	05
End Term Examination	50
<b>Total</b>	<b>100</b>

**L T P Cr**  
**4 0 0 4**

**UNIT-1**

**Introduction:** Natural Language Processing tasks in syntax, semantics, and pragmatics, Issues, Applications. The role of machine learning, Probability Basics ,Information theory ,Collocations N-gram Language Models, Estimating parameters and smoothing - Evaluating language models.

**UNIT-2**

**Morphology and part of speech tagging:** Linguistic essentials, Lexical syntax, Morphology and Finite State Transducers, Part of speech Tagging, Rule-Based Part of Speech Tagging, Markov Models, Hidden Markov Models, transformation based Models, Maximum Entropy Models, Conditional Random Fields.

**UNIT-3**

**Syntax Parsing:** Syntax Parsing, Grammar formalisms and tree banks, Parsing with Context Free Grammars, Features and Unification, Statistical parsing and probabilistic CFGs (PCFGs), Lexicalized PCFGs.

**Semantic Analysis:** Representing Meaning, Semantic Analysis, Lexical semantics, Word sense disambiguation, Supervised, Dictionary based and Unsupervised Approaches Compositional semantics, Semantic Role Labeling and Semantic Parsing, Discourse Analysis.

**UNIT-4**

**Applications:** Named entity recognition and relation extraction- IE using sequence labeling Machine Translation (MT), basic issues in MT-Statistical translation-word alignment, phrase-based translation.

**Text Books:**

1. Daniel Jurafsky and James H. Martin “Speech and Language Processing (2nd Edition)”, Prentice Hall; 2 edition, 2008.
2. Christopher D. Manning and Hinrich Schuetze “Foundations of Statistical Natural Language Processing”, MIT Press, 1999.
3. Steven Bird, Ewan Klein and Edward Loper “Natural Language Processing with Python”, O’Reilly Media; 1 edition, 2009.

**Note for End Term Examination:** Attempt five questions in all, selecting one question each from the sections A, B, C and D. Section E is compulsory.

4. Roland R. Hausser, "Foundations of Computational Linguistics: Human- Computer Communication in Natural Language", Paperback, MIT Press, 2011

**Reference Books:**

1. Pierre M. Nugues, An Introduction to Language Processing with Perl and Prolog: An Outline of Theories, Implementation, and Application with Special Consideration of English, French, and German (Cognitive Technologies) Softcover reprint, 2010
2. James Allen, Natural Language Understanding, Addison Wesley; 2 edition 1994
3. NLTK – Natural Language Tool Kit - <http://www.nltk.org/>

**Course Name :- Cloud Computing**  
**Course Code: - PCS-207**

<b>Assessment and Evaluation Components</b>	
Quizzes /Assignments/ Presentation/Class Test/ Open Book Test/ Case Study	25
Mid Term Tests (MTE)	20
Attendance Marks	05
End Term Examination	50
<b>Total</b>	<b>100</b>

**L T P Cr**  
**4 0 0 4**

### UNIT-1

**Cloud Computing Basics:** Overview, Applications, Intranets and the Cloud. Your Organization and Cloud Computing- Benefits, Limitations, Security Concerns. Hardware and Infrastructure-Clients, Security, Network, Services. Software as a Service (SaaS)- Understanding the Multitenant Nature of SaaS Solutions, Understanding SOA. Platform as a Service (PaaS)-IT Evolution Leading to the Cloud, Benefits of PaaS Solutions, Disadvantages of PaaS Solutions. Infrastructure as a Service (IaaS)-Understanding IaaS, Improving Performance through Load Balancing, System and Storage Redundancy, Utilizing Cloud-Based NAS Devices, Advantages, Server Types. Identity as a Service (IDaaS)- Understanding Single Sign-On (SSO), OpenID, Mobile ID Management.

### UNIT-2

**Cloud Storage:** Overview, Cloud Storage Providers. Virtualization-Understanding Virtualization, History, Leveraging Blade Servers, Server Virtualization, Data Storage Virtualization. Securing the Cloud- General Security Advantages of Cloud-Based Solutions, Introducing Business Continuity and Disaster Recovery.

### UNIT-3

**Disaster Recovery:** Understanding the Threats. Service Oriented Architecture-Understanding SOA, Web Services Are Not Web Pages, Understanding Web Service Performance, Reuse and Interoperability. Developing Applications-Google, Microsoft, Cast Iron Cloud, Bungee Connect, Development. Migrating to the Cloud-Cloud Services for Individuals, Cloud Services Aimed at the Mid-Market, Enterprise-Class Cloud Offerings, and Migration.

### UNIT-4

**Designing Cloud Based Solutions:** System Requirements, Design Is a Give-and-Take Process. Coding Cloud Based Applications-Creating a Simple Yahoo Pipe, Using Google App Engine and creating a Windows Azure Application.Application Scalability-Load-Balancing Process, Designing for Scalability, Capacity Planning Versus Scalability, Scalability and Diminishing Returns and Performance Tuning.

**Note for End Term Examination:** Attempt five questions in all, selecting one question each from the sections A, B, C and D. Section E is compulsory.



**Text Books:**

1. Anthony T. Velte Toby J. Velte, Robert Elsenpeter, “Cloud Computing: A Practical Approach”, 2010 by Tata McGraw-Hill.
2. Dr. Kris Jamsa. “Cloud Computing: SaaS, PaaS, IaaS, Virtualization and more”.

**Reference Books:**

1. Cloud Computing Bible by Barrie Sosinsky, Published by Wiley Publishing, 2011.
2. Cloud Computing for Dummies by Judith Hurwitz, Robin Bloor, Marcia Kaufman, and Dr. Fern Halper, Wiley Publishing, 2010.
3. Moving to The Cloud, DinakarSitaram, Elsevier, 2014.
4. Cloud Computing Theory And Practice Danc.Marinercus, Elsevier, 2013.

**Note for End Term Examination:** Attempt five questions in all, selecting one question each from the sections A, B, C and D. Section E is compulsory.

**Course Name :- Software Testing and Quality Management**  
**Course Code: - PCS-208**

<b>Assessment and Evaluation Components</b>	
Quizzes /Assignments/ Presentation/Class Test/ Open Book Test/ Case Study	25
Mid Term Tests (MTE)	20
Attendance Marks	05
End Term Examination	50
<b>Total</b>	<b>100</b>

**L T P Cr**  
**4 0 0 4**

**UNIT-1**

**Introduction:** Software Engineering, Software Process Models, Management Process, Scheduling, Estimation, Software Metrics.

**Software Quality:** Quality Concepts, Quality Control, Quality Assurance, Cost of Quality, SQA Activities, Total Quality Management Principles, Software Reviews, Formal Technical Reviews, Software Reliability, Software Safety, ISO Approaches to Quality Assurance Systems.

**Standards, Practices, Conventions and Metrics:** Quality Assurance Standards, ISO 9000, ISO 9001:2000, ISO 9126 Quality Factors, CMM, Six Sigma, Software Quality Assurance Metrics, Advantages, QA Techniques, Introduction to SPICE.

**UNIT-2**

**Risk and Software Configuration Management:** Software Risks, The RMMM Plan, Software Configuration Management Process: Version Control, Change Control.

**Software Testing:** Testing, Test Strategies for Conventional and Object Oriented Software, Unit and Integration Testing, Validation Testing, System Testing, Metrics for Source Code, Metrics for Testing, Debugging.

**UNIT-3**

**Testing Techniques for Conventional and Object Oriented Software:** Black Box and White Box Testing, Basis Path Testing, Control Structure Testing, Object Oriented Testing Methods: Applicability of Conventional Test Case Design Methods, Testing Methods Applicable at the Class Level.

**UNIT-4**

**Testing Process:** Test Plan development, Requirement Phase Testing, Design Phase Testing, Program Phase Testing, Execute Test and Record Results.

**Testing Specialized Systems and Applications:** Testing Client/Server Systems, Testing Web based Systems, Testing in Multiplatform Environment, Testing Off-the-Shelf Software, Testing for Real Time Systems, Testing Security.

**Text Books:**

1. Ian Sommerville : Software Engineering, Seventh Edition, Pearson Education.
2. William E. Perry: Effective Methods for Software Testing, Second Edition, John Wiley & Sons.

**Note for End Term Examination:** Attempt five questions in all, selecting one question each from the sections A, B, C and D. Section E is compulsory.

3. R.S. Pressman: Software Engineering: A Practitioner's Approach, Sixth Edition, Tata McGraw-Hill.

**Reference Books:**

1. Boris Beizer: Software Testing Techniques, Second Edition, Dreamtech.
2. Nina S Godbole: Software Quality Assurance – Principles and Practice, Narosa.
3. S.L. Pfleeger, J.M. Atlee : Software Engineering: Theory and Practice, Second Edition, Pearson Education.
4. K.K. Aggarwal, Yogesh Singh: Software Engineering, Second Edition, New Age International.
5. Pankaj Jalote: An Integrated Approach to Software Engineering, Second Edition.

**Note for End Term Examination:** Attempt five questions in all, selecting one question each from the sections A, B, C and D. Section E is compulsory.

**Course Name :- Software Verification Validation and Testing**  
**Course Code: - PCS-209**

<b>Assessment and Evaluation Components</b>	
Quizzes /Assignments/ Presentation/Class Test/ Open Book Test/ Case Study	25
Mid Term Tests (MTE)	20
Attendance Marks	05
End Term Examination	50
<b>Total</b>	<b>100</b>

**L T P Cr**  
**4 0 0 4**

**UNIT-1**

Software Engineering : Overview of software evolution, design models, development life cycle, unit and system testing, project management, maintenance, Concept of Software verification, validation and testing.

V & V and their Limitations: Theoretical Foundations: Impracticality of Testing All data; Impracticality of testing All Paths; No Absolute Proof of Correctness.

**UNIT-2**

Verification & Validation: Types of Products, Requirements; Specifications, Designs, Implementation, Changes, V & V Objectives, Correctness, Consistency, Necessity Sufficiency, Performance. Software

Reliability and Quality Assurance: Software reliability, validation, safety and hazards analysis; features affecting quality of software. Concepts and importance of quality assurance, Software quality assurance strategies, FTR, structured walk through techniques.

**UNIT-3**

Software V & V Approaches: Software Technical Reviews, Software Testing: Levels of testing, Module, Integration, System, Regression, Testing techniques and their Applicability, Functional testing and Analysis Structural testing and Analysis, Error Oriented testing and Analysis, Hybrid Approaches, Integration Strategies, Transaction. Flow Analysis, Stress Analysis, Failure Analysis, Concurrency Analysis, Performance Analysis Proof of Correctness, Simulation and Prototyping, Requirements Tracing.

**UNIT-4**

Software V & V Planning: Identification and Selection techniques: requirements, Specifications, Designs, Implementations, Changes, organizations Responsibilities, Development. Organization Independent test Organization.

Software Quality Assurance: Independent V &V contractor, V & V Standards, Integrating V & V Approaches, Problem Tracking Test Activities, Assessment.

**Text Books:**

1. Effective Methods for Software Testing : William Perry, John Wiley & Sons, 1995.

**Note for End Term Examination:** Attempt five questions in all, selecting one question each from the sections A, B, C and D. Section E is compulsory.

2. Software Testing; Mare Roper, McGraw Hill Book Co., London, 1994.

**Reference Books:**

1. Testing Computer Software; Cem Kaner, Jack Falk, Nguyen Quoc, 2nd ed. Van Nostrand Reinhold, 1993

**Course Name :- Agile Software Development**  
**Course Code: - PCS-210**

<b>Assessment and Evaluation Components</b>	
Quizzes /Assignments/ Presentation/Class Test/ Open Book Test/ Case Study	25
Mid Term Tests (MTE)	20
Attendance Marks	05
End Term Examination	50
<b>Total</b>	<b>100</b>

**L T P Cr**  
**4 0 0 4**

**UNIT-1**

**Agile Software Development:** Basics and Fundamentals of Agile Process Methods, Values of Agile, Principles of Agile, stakeholders, Challenges.

**Lean Approach:** Waste Management, Kaizen and Kanban, add process and products add value. Roles related to the lifecycle, differences between Agile and traditional plans, differences between Agile plans at different lifecycle phases. Testing plan links between testing, roles and key techniques, principles, understand as a means of assessing the initial status of a project/ How Agile helps to build quality.

**UNIT-2**

**Agile and Scrum Principles:** Agile Manifesto, Twelve Practices of XP, Scrum Practices, Applying Scrum. Need of scrum, working of scrum, advanced Scrum Applications, Scrum and the Organization, scrum values.

**Agile Product Management:** Communication, Planning, Estimation Managing the Agile approach Monitoring progress, Targeting and motivating the team, managing business involvement, Escalating issue. Quality, Risk, Metrics and Measurements, Managing the Agile approach Monitoring progress, Targeting and motivating the team, Managing business involvement and Escalating issue.

**UNIT-3**

**Agile Requirements:** User Stories, Backlog Management. Agile Architecture: Feature-Driven Development. Agile Risk Management: Risk and Quality Assurance, Agile Tools.

**Agile Testing:** Agile Testing Techniques, Test-Driven Development, User Acceptance Test.

**UNIT-4**

**Agile Review:** Agile Metrics and Measurements, The Agile approach to estimating and project variables, Agile Measurement, Agile Control: the 7 control parameters. Agile approach to Risk, The Agile approach to Configuration Management, The Atern Principles, Atern Philosophy, The rationale for using Atern, Refactoring, Continuous integration, Automated Build Tools Scaling Agile for large projects: Scrum of Scrums, Team collaborations, Scrum, Estimate a Scrum Project, Track Scrum Projects, Communication in Scrum Projects, Best Practices to Manage Scrum.

**Text Books:**

1. Agile Software Development, Principles, Patterns, and Practices (Alan Apt Series) Robert C.

**Note for End Term Examination:** Attempt five questions in all, selecting one question each from the sections A, B, C and D. Section E is compulsory.

Martin (Author), 2011.

**Reference Books:**

1. Succeeding with Agile: Software Development Using Scrum, Pearson 2010.

**Note for End Term Examination:** Attempt five questions in all, selecting one question each from the sections A, B, C and D. Section E is compulsory.

## **ELECTIVE II**

**Note for End Term Examination:** Attempt five questions in all, selecting one question each from the sections A, B, C and D. Section E is compulsory.



**Course Name :- Optimization Techniques**  
**Course Code: - PCS-211**

<b>Assessment and Evaluation Components</b>	
Quizzes /Assignments/ Presentation/Class Test/ Open Book Test/ Case Study	25
Mid Term Tests (MTE)	20
Attendance Marks	05
End Term Examination	50
<b>Total</b>	<b>100</b>

**L T P Cr**  
**4 0 0 4**

**UNIT-1**

Introduction to Optimization Techniques, Origin & development of O.R., Nature & Characteristic, features of O.R., Models & Modeling in Operation Research. Methodology of O.R. Linear Programming - Mathematical Model, Assumptions of Linear Programming, Graphical Method, Principles of Simplex method and its Applications, Two Phase & Big M- method, Revised simplex method, Duality, Dual simplex method- Primal Dual Relationship and sensitivity analysis.

**UNIT-2**

**Linear Programming:** Mathematical formation of linear programming problem, Special types of linear programming problems -Transportation and assignment problems, Unbalanced Assignment problems, Crew based assignment problems, Test for Optimality, Degeneracy in Transportation Problems, Unbalanced Transportation Problems.

**UNIT-3**

Definition of Probability, Sample Space, Algebra of Events, Addition and multiplication law of probability, Conditional Probability. Dynamic Programming-Features and applications of dynamic programming.

**UNIT-4**

Decision Theory, Integer Programming, Gomory Method and Branch & Bound Method.

**Text Books:**

1. V.K Kapoor, "Operation Research", Sultan Chand & Co., New Delhi.
2. Manmohan Gupta "Operation Research", Sultan Chand & Co., New Delhi.
3. Richard Pronsen, "Theory and Problems of Operation Research", McGraw Hill, 1983.
4. F.S. Hiller, & G.J. Liberman, "Introduction to Operations Research", 2nd Edn. Holden

**Reference Books:**

1. S. S Rao, 1978 "Introduction to Optimization: Theory & Applications", Wiley Eastern.
2. L.S Srinath, "Linear Programming", East-West, New Delhi.

**Note for End Term Examination:** Attempt five questions in all, selecting one question each from the sections A, B, C and D. Section E is compulsory.

**Course Name :- Distributed Operating System**  
**Course Code: - PCS-212**

<b>Assessment and Evaluation Components</b>	
Quizzes /Assignments/ Presentation/Class Test/ Open Book Test/ Case Study	25
Mid Term Tests (MTE)	20
Attendance Marks	05
End Term Examination	50
<b>Total</b>	<b>100</b>

**L T P Cr**  
**4 0 0 4**

**UNIT-1**

**Distributed computing systems fundamentals:** Introduction to Distributed computing systems, Models, Popularity. Distributed Computing system. Design issues of Distributed operating system. Distributed computing environment.

**UNIT-2**

**Message Passing:** Features of a good Message Passing System, Issues in IPC by Message Passing Synchronization, Buffering, Multi datagram Messages, Encoding and Decoding Message data, Process Addressing, Failure Handling, Group Communication. RPC Model, Transparency of RPC, RPC messages, Marshaling Arguments and Results. Server Management, Parameter Passing semantics, Call semantics, Communication Protocols for RPCs, Client Server Building, Exception handling, Security, RPC in Heterogeneous Environments, Lightweight RPC.

**UNIT-3**

**Distributed Shared Memory:** General architecture of DSM systems. Design and implementation Issues of DSM, Granularity, Structure of Shared Memory Space. Consistency models, Replacement strategy, Thrashing. Synchronization: Clock Synchronization. Event Ordering, Mutual Exclusion, Deadlock, Election Algorithms.

**UNIT-4**

**Resource Management:** Features of global scheduling algorithm. Task assignment approach, Load-Balancing and Load approach. Process Management: Introduction, Process Migration, Threads. Distributed File Systems: Features of good DFS, File models, File Accessing models

**Text Books:**

1. Pradeep Sinha K., "Distributed Operating Systems concepts and design", PHI learning private limited.
2. Mukesh Singhal, Niranjana G Shivarathri, "Advanced Concepts in Operating systems", Tata McGraw Hill Ltd.

**Note for End Term Examination:** Attempt five questions in all, selecting one question each from the sections A, B, C and D. Section E is compulsory.

**Reference Books:**

- 1.Coulouris.G, Dollimore J & Kindberg T, “Distributed Systems concepts and design”, 4thedition, Pearson Education.
- 2.Tanenbaum A S, “ Modern Operating System”, PHI learning private limited, 3<sup>rd</sup> edition.

**Course Name :- Object Oriented Analysis and Design using UML**  
**Course Code: - PCS-213**

<b>Assessment and Evaluation Components</b>	
Quizzes /Assignments/ Presentation/Class Test/ Open Book Test/ Case Study	25
Mid Term Tests (MTE)	20
Attendance Marks	05
End Term Examination	50
<b>Total</b>	<b>100</b>

**L T P Cr**  
**4 0 0 4**

**UNIT-1**

**Object Oriented Design and Modeling:** Object Oriented Fundamentals, Objects and object classes, object oriented design process, importance of modeling, principles of modeling, object oriented modeling.

**Introduction to UML:** Conceptual model of UML, building blocks of UML, Mechanisms in UML, architecture, software development life cycle.

**UNIT-2**

**Basic Structural Modeling:** Classes, relationships, common mechanisms, class and object diagrams.

**Advanced structural Modeling:** Advanced classes, advanced relationships, Interfaces types and roles, packages, instances and object diagrams.

**UNIT-3**

**Collaboration Diagrams and Sequence Diagrams:** Terms, concepts and depicting a message in collaboration diagrams. Terms and concepts in sequence diagrams. Difference between collaboration and sequence. diagram. Depicting synchronous messages with/without priority call back mechanism.

**Basic behavioral Modeling:** Interactions, use cases, Use Case Diagrams, Interaction Diagrams and activity diagrams.

**UNIT-4**

**Advanced Behavioral Modeling:** Events and signals, state machines, process and threads, time and space, state chart diagrams.

**Architectural Modeling:** Terms, Concepts, examples, Modeling techniques for component diagrams and deployment diagrams.

**Text Books:**

1. Grandy Booch, James Rumbough, Ivar Jacobson, "The Unified Modelling Language User Guide" Pearson Edutaion 2002.
2. Ian Sommerville, "Software Engineering Sixth Edition2003" Tata McGraw Hill Publishing Company.

**Note for End Term Examination:** Attempt five questions in all, selecting one question each from the sections A, B, C and D. Section E is compulsory.

**Reference Books:**

1. Meilir Page Jones, "Fundamentals of Object Oriented Design in UML" Addison Wesley 2000.

**Course Name :- Advanced Artificial Intelligence**  
**Course Code: - PCS-214**

<b>Assessment and Evaluation Components</b>	
Quizzes /Assignments/ Presentation/Class Test/ Open Book Test/ Case Study	25
Mid Term Tests (MTE)	20
Attendance Marks	05
End Term Examination	50
<b>Total</b>	<b>100</b>

**L T P Cr**  
**4 0 0 4**

**UNIT-1**

**Introduction:** Introduction to AI, AI techniques, level of model, criteria for success, Turing test, Function and Recursion, Tuples, patterns, Lists, concrete data types, Inductive definitions, Induction on concrete data, Formal syntax, Operational semantics.

**Problems, Problem Spaces & Search:** Defining problem as a space, search, production system, problem characteristics, production system characteristics, issues in the design of search programs.

**UNIT-2**

**Heuristics Search Strategies:** Generate and test, Hill climbing, best first search(A\*), problem reduction(AO\*), constraint satisfaction, Means Ends analysis.

**Knowledge Representation Issues:** Representations and mappings, Approaches to knowledge representation, The frame problem, Semantic network, Frame representation.

**UNIT-3**

**Using Predicate Logic:** Representing simple facts in logic, representing instance and is-a relationship, Computable functions and predicates, Resolution, Natural deduction.

**Representing Knowledge Using Rules:** Procedural Vs Declarative knowledge, Logic programming, Forward and Backward searching, Matching knowledge representation.

**UNIT-4**

**Game Playing and Search:** Introduction, Min-Max algorithm, Alpha-Beta cut off, Example of Games.

**Intelligent Systems:** Learning Model, Types of Learning, Components of an Expert System, categories of Expert System, stages of Development of Expert System, Expert System Development Tools., Overview of fuzzy systems, ANN, Swarm Intelligent systems

**Text Books:**

1. N.J. NILSSON, "Principles of artificial Intelligence" Narosa Publishing House.
2. E. RICH AND KNIGHT, Artificial Intelligence, McGraw Hill International.

**Reference Books:**

1. PETERSON, "Artificial Intelligence", PHI Ltd.
2. R.FORSYTH, "Expert systems, Principles and Case Studies" Chapman and Hill.
3. R. KELLER, "Expert system Technology Development and Application" Yourdon Press.

**Note for End Term Examination:** Attempt five questions in all, selecting one question each from the sections A, B, C and D. Section E is compulsory.

**Course Name :- Business Intelligence**  
**Course Code: - PCS-215**

<b>Assessment and Evaluation Components</b>	
Quizzes /Assignments/ Presentation/Class Test/ Open Book Test/ Case Study	25
Mid Term Tests (MTE)	20
Attendance Marks	05
End Term Examination	50
<b>Total</b>	<b>100</b>

**L T P Cr**  
**4 0 0 4**

**UNIT-1**

**Introduction to Business Intelligence:** 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, Data Warehousing and Marts, Corporate Dashboards, Corporate Performance Management.

**UNIT-2**

**Basics of Data Integration (Extraction Transformation Loading):** Concepts of data integration need and advantages of using data integration, introduction to common data integration approaches, introduction to ETL using SSIS, Introduction to data quality, data profiling concepts and applications

**UNIT-3**

**Introduction to Multi-Dimensional Data Modeling:** 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, introduction to business metrics and KPIs, creating cubes using SSAS.

**UNIT-4**

**Enterprise Reporting:** Basics of Enterprise Reporting, Introduction to enterprise reporting, concepts of dashboards, balanced scorecards, introduction to SSRS Architecture, enterprise reporting using SSRS.

**Text Books:**

1. David Loshin, "Business Intelligence".
2. Mike Biere, "Business intelligence for the enterprise".
3. Business intelligence roadmap by Larissa Terpeluk Moss, Shaku Atre

**Reference Books:**

1. Cindi Howson"Successful Business Intelligence: Secrets to making Killer BI Applications".
2. Brain, Larson, "Delivering business intelligence with Microsoft SQL server 2008".
3. Lynn Langit, "Foundations of SQL Server 2005 Business Intelligence".
4. Stephen Few,"Information dashboard design" .

**Note for End Term Examination:** Attempt five questions in all, selecting one question each from the sections A, B, C and D. Section E is compulsory.