Maulana Abul Kalam Azad University of Technology, West Bengal

(Formerly West Bengal University of Technology)

Syllabus for B. Tech in Computer Science & Engineering

(Applicable from the academic session 2020-2021)

SEMESTER – VI

Database Management Systems
Code: PCC-CS601
Contact: 3L

Name of the Course:	**Database Management Systems**	
Course Code: PCC-CS601	Semester: VI	
Duration:6 months	Maximum Marks:100	
Teaching Scheme		**Examination Scheme**
Theory:3 hrs./week		Mid Semester exam: 15
Tutorial: NIL		Assignment and Quiz: 10 marks
		Attendance: 5 marks
Practical: hrs./week		End Semester Exam:70 Marks
Credit Points:	3	

Objective:	
1	To understand the different issues involved in the design and implementation of a database system.
2	To study the physical and logical database designs, database modeling, relational, hierarchical, and network models
3	To understand and use data manipulation language to query, update, and manage a database
4	To develop an understanding of essential DBMS concepts such as: database security, integrity, concurrency, distributed database, and intelligent database, Client/Server (Database Server), Data Warehousing.
5	To design and build a simple database system and demonstrate competence with the fundamental tasks involved with modeling, designing, and implementing a DBMS.
6	To understand the different issues involved in the design and implementation of a database system.

Unit	Content	Hrs/Unit	Marks/Unit
1	**Database system architecture:** Data Abstraction, Data Independence,Data Definition Language(DDL),Data Manipulation Language(DML). **Data models:** Entity-relationship model, network model, relational and object oriented data models, integrity constraints, data manipulation operations.	9	

2	**Relational query languages:** Relational algebra, Tuple and domain relational calculus, SQL3, DDL and DML constructs, Open source and Commercial DBMS - MYSQL, ORACLE, DB2, SQLserver. **Relational database design:** Domain and data dependency, Armstrong's axioms, Normal forms, Dependency preservation, Losslessdesign. **Query processing and optimization:** Evaluation of relational algebra expressions, Query equivalence, Join strategies, Query optimization algorithms.	13	
3	**Storage strategies**: Indices, B-trees, hashing.	3	
4.	**Transaction processing:** Concurrency control, ACID property, Serializability of scheduling, Locking and timestamp based schedulers, Multi-version and optimistic Concurrency Control schemes, Database recovery.	5	
5	**Database Security:** Authentication, Authorization and access control, DAC, MAC and RBAC models, Intrusion detection, SQL injection.	3	
6	**Advanced topics:** Object oriented and object relational databases, Logical databases, Web databases, Distributed databases, Data warehousing and data mining.	3	

Text book and Reference books:

1. "Database System Concepts" , 6th Edition by Abraham Silberschatz, Henry F. Korth, S. Sudarshan,McGraw-Hill.
2. "Principles of Database and Knowledge – Base Systems", Vol 1 by J. D. Ullman, Computer Science Press.
3. Database Management Systems, R.P. Mahapatra, Khanna Publishing House, New Delhi (AICTE Recommended Textbook – 2018)

4.“Fundamentals of Database Systems” , 5th Edition by R. Elmasri and S. Navathe,
5.PearsonEducation “Foundations of Databases”, Reprint by Serge Abiteboul, Richard Hull, Victor Vianu,Addison-Wesley

Course Outcomes:

On completion of the course students will be able to

1. For a given query write relational algebra expressions for that query and optimize the developedexpressions
2. For a given specification of the requirement design the databases using E R method andnormalization.
3. For a given specification construct the SQL queries for Open source and Commercial DBMS -MYSQL, ORACLE, andDB2.
4. For a given query optimize its execution using Query optimizationalgorithms
5. For a given transaction-processing system, determine the transaction atomicity, consistency, isolation, anddurability.
6. Implement the isolation property, including locking, time stamping based on concurrency control and Serializability of scheduling.

Computer Networks
Code: PCC-CS602
Contact: 3L

Name of the Course:	**Computer Networks**	
Course Code: PCC-CS602	Semester: VI	
Duration:6 months	Maximum Marks:100	
Teaching Scheme		**Examination Scheme**
Theory:3 hrs./week		Mid Semester exam: 15
Tutorial: NIL		Assignment and Quiz: 10 marks
		Attendance: 5 marks
Practical: hrs./week		End Semester Exam:70 Marks
Credit Points:	3	

Objective:	
1	To develop an understanding of modern network architectures from a design and performance perspective.
2	To introduce the student to the major concepts involved in wide-area networks (WANs), local area networks (LANs) and Wireless LANs (WLANs).
3	To provide an opportunity to do network programming
4	To provide a WLAN measurement ideas.

Unit	Content	Hrs/Unit	Marks/Unit
1	Data communication Components: Representation of data and its flow Networks,Various Connection Topology, Protocols and Standards, OSI model, Transmission Media, LAN: Wired LAN, Wireless LANs, Connecting LAN and Virtual LAN, Techniques for Bandwidth utilization: Multiplexing - Frequency division, Time division and Wave division, Concepts on spread spectrum.	9	
2	Data Link Layer and Medium Access Sub Layer: Error Detection and Error Correction - Fundamentals, Block coding, Hamming Distance, CRC; Flow Control and Error control protocols - Stop and Wait, Go back – N ARQ, Selective Repeat ARQ, Sliding Window, Piggybacking,	8	

	Random Access, Multiple access protocols -Pure ALOHA, Slotted ALOHA,CSMA/CD,CDMA/CA		
3	Network Layer: Switching, Logical addressing – IPV4, IPV6; Address mapping – ARP, RARP, BOOTP and DHCP–Delivery, Forwarding and Unicast Routing protocols.	14	
4.	**Transport Layer:** Process to Process Communication, User Datagram Protocol (UDP), Transmission Control Protocol (TCP), SCTP Congestion Control; Quality of Service, QoS improving techniques: Leaky Bucket and Token Bucket algorithm.	8	
5	**Application Layer:** Domain Name Space (DNS), DDNS, TELNET, EMAIL, File Transfer Protocol (FTP), WWW, HTTP, SNMP, Bluetooth, Firewalls, Basic concepts of Cryptography.	8	

Text book and Reference books:

1. Introduction to Algorithms" by Cormen, Leiserson, Rivest, Stein.
2. "The Design and Analysis of Computer Algorithms" by Aho, Hopcroft, Ullman.
3. "Algorithm Design" by Kleinberg and Tardos.
4. Design & Analysis of Algorithms, Gajendra Sharma, Khanna Publishing House, New Delhi

Course Outcomes:

On completion of the course students will be able to

1. Understand research problem formulation.
2. Analyze research related information
3. Follow research ethics
4. Understand that today's world is controlled by Computer, Information Technology, but tomorrow world will be ruled by ideas, concept, and creativity.
5. Understanding that when IPR would take such important place in growth of individuals & nation, it is needless to emphasis the need of information about Intellectual Property Right to be promoted among students in general & engineering in particular.
6. Understand that IPR protection provides an incentive to inventors for further research work and investment in R & D, which leads to creation of new and better products, and in turn brings about, economic growth and social benefits.

Advanced Algorithms
Code: PEC-IT601 A
Contact: 3L

Name of the Course:	**Advanced Algorithms**	
Course Code: **PEC-IT601A**	Semester: VI	
Duration:6 months	Maximum Marks:100	
Teaching Scheme		**Examination Scheme**
Theory:3 hrs./week		Mid Semester exam: 15
Tutorial: NIL		Assignment and Quiz: 10 marks
		Attendance: 5 marks
Practical: NIL		End Semester Exam:70 Marks
Credit Points:	3	

Objective:	
1	Introduce students to the advanced methods of designing and analyzing algorithms.
2	The student should be able to choose appropriate algorithms and use it for a specific problem.
3	To familiarize students with basic paradigms and data structures used to solve advanced algorithmic problems.
4	Students should be able to understand different classes of problems concerning their computation difficulties.
5	To introduce the students to recent developments in the area of algorithmic design.
Pre-Requisite:	
1	Algorithm Design and Analysis

Unit	Content	Hrs/Unit	Marks/Unit
1	**Sorting:** Review of various sorting algorithms, topological sorting **Graph:** Definitions and Elementary Algorithms: Shortest path by BFS, shortest path in edge-weighted case (Dijkasra's), depth-first search and computation of strongly connected components, emphasis on correctness proof of the algorithm and time/space analysis, example of amortized analysis.	6	
2	**Matroids:** Introduction to greedy paradigm, algorithm to compute a maximum weight maximal independent set. Application to	8	

	MST. **Graph Matching:** Algorithm to compute maximum matching. Characterization of maximum matching by augmenting paths, Edmond's Blossom algorithm to compute augmenting path.		
	Flow-Networks: Maxflow-mincut theorem, Ford-Fulkerson Method to compute maximum flow, Edmond-Karp maximum-flow algorithm. **Matrix Computations:** Strassen's algorithm and introduction to divide and conquer paradigm, inverse of a triangular matrix, relation between the time complexities of basic matrix operations, LUP-decomposition.	9	
3	**Shortest Path in Graphs:** Floyd-Warshall algorithm and introduction to dynamic programming paradigm. More examples of dynamic programming. **Modulo Representation of integers/polynomials:** Chinese Remainder Theorem, Conversion between base-representation and modulo-representation. Extension to polynomials. Application: Interpolation problem. **Discrete Fourier Transform (DFT):** In complex field, DFT in modulo ring. Fast Fourier Transform algorithm. Schonhage-Strassen Integer Multiplication algorithm	10	
4.	**Linear Programming:** Geometry of the feasibility region and Simplex algorithm **NP-completeness:** Examples, proof of NP-hardness and NP-completeness. **One or more of the following topics based on time and interest** Approximation algorithms, Randomized Algorithms, Interior Point Method, Advanced Number Theoretic Algorithm	10	
5	Recent Trands in problem solving paradigms using recent searching and sorting techniques by applying recently proposed data structures.	5	

Text book and Reference books:

1. "Introduction to Algorithms" by Cormen, Leiserson, Rivest, Stein.
2. "The Design and Analysis of Computer Algorithms" by Aho, Hopcroft, Ullman.
3. "Algorithm Design" by Kleinberg and Tardos.
4. Design & Analysis of Algorithms, Gajendra Sharma, Khanna Publishing House, New Delhi

Course Outcomes:

On completion of the course students will be able to

1. Analyze the complexity/performance of different algorithms.
2. Determine the appropriate data structure for solving a particular set of problems.
3. Categorize the different problems in various classes according to their complexity.
4. Students should have an insight of recent activities in the field of the advanced data structure.

Distributed Database Management System
Code: PEC-IT601B
Contact: 3L

Name of the Course:	**Distributed Database Management System**	
Course Code: **PEC-IT601B**	Semester: VI	
Duration:6 months	Maximum Marks:100	
Teaching Scheme		**Examination Scheme**
Theory:3 hrs./week		Mid Semester exam: 15
Tutorial: NIL		Assignment and Quiz: 10 marks
		Attendance: 5 marks
Practical: NIL		End Semester Exam:70 Marks
Credit Points:	3	
Objective:		
1	To introduce the fundamental concepts and issues of managing large volume of shared data in a parallel and distributed environment, and to provide insight into related research problems.	
Pre-Requisite:		
1	Database Management Systems	

Unit	Content	Hrs/Unit	Marks/Unit
1	**INTRODUCTION** Distributed data processing; What is a DDBS; Advantages and disadvantages of DDBS; Problem areas; Overview of database and computer network concepts **DISTRIBUTED DATABASE MANAGEMENT SYSTEM ARCHITECTURE** Transparencies in a distributed DBMS; Distributed DBMS architecture; Global directory issues	8	

2	**DISTRIBUTED DATABASE DESIGN** Alternative design strategies; Distributed design issues; Fragmentation; Data allocation **SEMANTICS DATA CONTROL** View management; Data security; Semantic Integrity Control QUERY **PROCESSING ISSUES** Objectives of query processing; Characterization of query processors; Layers of query processing; Query decomposition; Localization of distributed data	11	
3	**DISTRIBUTED QUERY OPTIMIZATION** Factors governing query optimization; Centralized query optimization; Ordering of fragment queries; Distributed query optimization algorithms **TRANSACTION MANAGEMENT** The transaction concept; Goals of transaction management; Characteristics of transactions; Taxonomy of transaction models **CONCURRENCY CONTROL** Concurrency control in centralized database systems; Concurrency control in DDBSs; Distributed concurrency control algorithms; Deadlock management	11	
4.	Reliability issues in DDBSs; Types of failures; Reliability techniques; Commit protocols; Recovery protocols Algorithm	8	
5	**PARALLEL DATABASE** SYSTEMS Parallel architectures; parallel query processing and	6	
6	**ADVANCED TOPICS Mobile** Databases, Distributed Object Management, Multi-databases	4	

Text book and Reference books:

1. Principles of Distributed Database Systems, M.T. Ozsu and PValduriez, Prentice-Hall, 1991.
2. Distributed Database Systems, D. Bell and J. Grimson, Addison-Wesley, 1992.

Course Outcomes:

On completion of the course students will be able to

1. Design trends in distributed systems.
2. Apply network virtualization.
3. Apply remote method invocation and objects.

Signals & Systems
Code: PEC-IT601C
Contacts: 3L

Name of the Course:	**Signals & Systems**	
Course Code: PEC-IT601C	Semester: VI	
Duration: 6 months	Maximum Marks: 100	
Teaching Scheme		**Examination Scheme**
Theory:3 hrs./week		Mid Semester exam: 15
Tutorial: NIL		Assignment and Quiz: 10 marks
		Attendance: 5 marks
Practical: NIL		End Semester Exam:70 Marks
Credit Points:	3	

Unit	Content	Hrs/Unit	Marks/Unit
1	**Introduction to Signals and Systems :** Signals and systems as seen in everyday life, and in various branches of engineering and science. Signal properties: periodicity, absolute integrability, determinism and stochastic character. Some special signals of importance: the unit step, the unit impulse, the sinusoid, the complex exponential, some special time-limited signals; continuous and discrete time signals, continuous and discrete amplitude signals. System properties: linearity: additivity and homogeneity, shift-invariance, causality, stability, realizability.Examples.	3	

2	**Behavior of continuous and discrete-time LTI systems (8 hours)** Impulse response and step response, convolution, input-output behavior with periodic convergent inputs, cascade interconnections. Characterization of causality and stability of LTI systems. System representation through differential equations and difference equations. State-space Representation of systems. State-Space Analysis, Multi-input, multi-output representation. State Transition Matrix and its Role. Periodic inputs to an LTI system, the notion of a frequency response and its relation to the impulse response.	8	
3	**Fourier, Laplace and z- Transforms** Fourier series representation of periodic signals, Waveform Symmetries, Calculation of Fourier Coefficients. Fourier Transform, convolution/multiplication and their effect in the frequency domain, magnitude and phase response, Fourier domain duality. The Discrete- Time Fourier Transform (DTFT) and the Discrete Fourier Transform (DFT). Parseval's Theorem. Review of the Laplace Transform for continuous time signals and systems, system functions, poles and zeros of system functions and signals, Laplace domain analysis, solution to differential equations and system behavior. The z-Transform for discrete time signals and systems, system functions, poles and zeros of systems and sequences, z-domain analysis.	10	
4.	The Sampling Theorem and its implications. Spectra of sampled signals. Reconstruction: ideal interpolator, zero-order hold, first-order hold. Aliasing and its effects. Relation between continuous and discrete time systems. Introduction to the applications of signal and system theory: modulation for communication, filtering, feedback control systems.	9	

Text book and Reference books:

1. A. V. Oppenheim, A. S. Willsky and S. H. Nawab, " Signalsand systems", Prentice Hall India,1997.
2. J. G. Proakis and D. G. Manolakis, " Digital Signal Processing: Principles, Algorithms, and Applications" , Pearson,2006.
3. H. P. Hsu, " Signals and systems", Schaum'sseries, McGraw Hill Education,2010.
4. S. Haykinand B. V. Veen, " Signals and Systems", John Wiley and Sons,2007.
5. A. V. Oppenheim and R. W. Schafer, " Discrete-Time Signal Processing", Prentice Hall,2009.
6. M. J. Robert " Fundamentals of Signals and Systems", McGraw Hill Education, 2007.
7. B. P. Lathi, " LinearSystems and Signals", Oxford University Press,2009.
8. A. V. Oppenheim and R. W. Schafer, " Discrete-Time Signal Processing", Prentice Hall,2009.
9. M. J. Robert " Fundamentals of Signals and Systems", McGraw Hill Education, 2007.
10. B. P. Lathi, " LinearSystems and Signals", Oxford University Press,2009.
11. R. Anand, "Signals and Systems, Khanna Publishing House, 2018.

Course Outcomes:

- On completion of the course students will be able to
- Understand the concepts of continuous time and discrete time systems.
- Analyse systems in complex frequency domain.
- Understand sampling theorem and its implications.
- Understand the concepts of continuous time and discrete time systems.

Image Processing
Code:PEC-IT601 D
Contact: 3L

Name of the Course:	Image Processing	
Course Code: PEC-IT601D	Semester: VI	
Duration:6 months	Maximum Marks:100	
Teaching Scheme		**Examination Scheme**
Theory:3 hrs./week		Mid Semester exam: 15
Tutorial: NIL		Assignment and Quiz: 10 marks
		Attendance: 5 marks
Practical: NIL		End Semester Exam:70 Marks
Credit Points:	3	

Unit	Content	Hrs/Unit	Marks/Unit
1	**Introduction [3L]** Background, Digital Image Representation, Fundamental steps in Image Processing, Elements of Digital Image Processing - Image Acquisition, Storage, Processing, Communication, Display.	9	
2	**Digital Image Formation [4L]** A Simple Image Model, Geometric Model- Basic Transformation (Translation, Scaling, Rotation), Perspective Projection, Sampling & Quantization - Uniform & Non uniform.	4	
3	**Mathematical Preliminaries[9L]** Neighbour of pixels, Connectivity, Relations, Equivalence & Transitive Closure; Distance Measures, Arithmetic/Logic Operations, Fourier Transformation, Properties of The Two Dimensional Fourier Transform, Discrete Fourier Transform, Discrete Cosine & SineTransform.	9	

4.	**Image Enhancement [8L]** Spatial Domain Method, Frequency Domain Method, Contrast Enhancement -Linear & Nonlinear Stretching, Histogram Processing; Smoothing - Image Averaging, Mean Filter, Low-pass Filtering; Image Sharpening. High-pass Filtering, High- boost Filtering, Derivative Filtering, Homomorphic Filtering; Enhancement in the frequency domain - Low pass filtering, High pass filtering.	8	
5	**Image Restoration [7L]** Degradation Model, Discrete Formulation, Algebraic Approach to Restoration - Unconstrained & Constrained; Constrained Least Square Restoration, Restoration by Homomorphic Filtering, Geometric Transformation - Spatial Transformation, Gray Level Interpolation.	7	
6	**Image Segmentation [7L]** Point Detection, Line Detection, Edge detection, Combined detection, Edge Linking & Boundary Detection - Local Processing, Global Processing via The Hough Transform; Thresholding - Foundation, Simple Global Thresholding, Optimal Thresholding; Region Oriented Segmentation - Basic Formulation, Region Growing by Pixel Aggregation, Region Splitting & Merging.	7	

Text book and Reference books:

1. Hearn, Baker – "Computer Graphics (C version 2nd Ed.)" – Pearson education
2. Z. Xiang, R. Plastock – " Schaum's outlines Computer Graphics (2nd Ed.)" – TMH
3. D. F. Rogers, J. A. Adams – "Mathematical Elements for Computer Graphics (2nd Ed.)" – TMH

Parallel and Distributed Algorithms
Code: PEC-IT602A
Contacts: 3L

Name of the Course:	**Parallel and Distributed Algorithms**	
Course Code **PEC-IT602A**	Semester: VI	
Duration: 6 months	Maximum Marks: 100	
Teaching Scheme		**Examination Scheme**
Theory:3 hrs./week		Mid Semester exam: 15
Tutorial: NIL		Assignment and Quiz: 10 marks
		Attendance: 5 marks
Practical: NIL		End Semester Exam:70 Marks
Credit Points:	3	

Unit	Content	Hrs/Unit	Marks/Unit
1	**UNIT-I :**Basic Techniques, Parallel Computers for increase Computation speed, Parallel & Cluster Computing	8	
2	**UNIT-II :**Message Passing Technique- Evaluating Parallel programs and debugging, Portioning and Divide and Conquer strategies examples	8	
3	UNIT-III :Pipelining- Techniques computing platform, pipeline programs examples	8	
4.	**UNIT-IV:**Synchronous Computations, load balancing, distributed termination examples, programming with shared memory, shared memory multiprocessor constructs for specifying parallelist sharing data parallel programming languages and constructs, open MP	11	
5	**UNIT-V :**Distributed shared memory systems and programming achieving constant memory distributed shared memory programming primitives, algorithms – sorting and numerical algorithms.	9	

Text book and Reference books:

1. Parallel Programming, Barry Wilkinson, Michael Allen, Pearson Education, 2nd Edition.
2. Introduction to Parallel algorithms by Jaja from Pearson, 1992.

Data Warehousing and Data Mining
Code: PEC-IT602B
Contacts: 3L

Name of the Course:	**Data Warehousing and Data Mining**	
Course Code **PEC-IT602B**	Semester: VI	
Duration: 6 months	Maximum Marks: 100	
Teaching Scheme		**Examination Scheme**
Theory:3 hrs./week		Mid Semester exam: 15
Tutorial: NIL		Assignment and Quiz: 10 marks
		Attendance: 5 marks
Practical: NIL		End Semester Exam:70 Marks
Credit Points:	3	

Unit	Content	Hrs/Unit	Marks/Unit
	Unit 1:		
1	Introduction to Data Warehousing; Data Mining: Mining frequent patterns, association and correlations; Sequential Pattern Mining concepts, primitives, scalable methods;	8	
2	**Unit 2:** Classification and prediction; Cluster Analysis – Types of Data in Cluster Analysis, Partitioning methods, Hierarchical Methods; Transactional Patterns and other temporal based frequent patterns,	8	
3	**Unit 3:** Mining Time series Data, Periodicity Analysis for time related sequence data, Trend analysis, Similarity search in Time-series analysis;	8	
4.	**Unit 4:** Mining Data Streams, Methodologies for stream data processing and stream data systems, Frequent pattern mining in stream data, Sequential Pattern Mining in Data Streams, Classification of dynamic data streams, Class Imbalance Problem; Graph Mining; Social Network Analysis;modulation for communication, filtering, feedback control systems.	11	

	Unit 5: Web Mining, Mining the web page layout structure, mining web link structure, mining multimedia data on the web, Automatic classification of web documents and web usage mining; Distributed Data Mining.	9	
	Unit 6: Recent trends in Distributed Warehousing and Data Mining, Class Imbalance Problem; Graph Mining; Social Network Analysis	5	

Text book and Reference books:

1. Data Warehousing Fundamentals for IT Professionals, Second Edition by Paulraj Ponniah, Wiley India.
2. Data Warehousing, Data Mining, & OLAP – Second Edition by Alex Berson and Stephen J. Smith, Tata McGraw Hill Education
3. Data warehouse Toolkit by Ralph Kimball, Wiley India
4. Data Mining & Warehousing by Ikvinderpal Singh, Khanna Publishing House
5. Jiawei Han and M Kamber, Data Mining Concepts and Techniques,, Second Edition, Elsevier Publication, 2011.
6. Vipin Kumar, Introduction to Data Mining - Pang-Ning Tan, Michael Steinbach, Addison Wesley,2006.
7. G Dong and J Pei, Sequence Data Mining, Springer, 2007.

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

1. Study of different sequential pattern algorithms
2. Study the technique to extract patterns from time series data and it application in real world.
3. Can extend the Graph mining algorithms to Web mining
4. Help in identifying the computing framework for Big Data

Human Computer Interaction
Code:PEC-IT602C
Contact: 3L

Name of the Course:	**Human Computer Interaction**		
Course Code: PEC-IT602C	Semester: VI		
Duration: 6 months	Maximum Marks:100		
Teaching Scheme		**Examination Scheme**	
Theory:3 hrs./week		Mid Semester exam: 15	
Tutorial: NIL		Assignment and Quiz: 10 marks	
		Attendance : 5 marks	
Practical: NIL		End Semester Exam :70 Marks	
Credit Points:	3		
Objective:			
1	Learn the foundations of Human Computer Interaction		
2	Be familiar with the design technologies for individuals and persons with disabilities		
3	Be aware of mobile Human Computer interaction		
4	Learn the guidelines for user interface.		
Pre-Requisite:			
1	Computer Organization &Architecture		

Unit	Content	Hrs/Unit	Marks/ Unit
1	Human: I/O channels – Memory – Reasoning and problem solving; The computer: Devices – Memory – processing and networks; Interaction: Models – frameworks – Ergonomics – styles – elements – interactivity- Paradigms.	9	
2	Interactive Design basics – process – scenarios – navigation – screen design – Iteration and prototyping. HCI in software process – software life cycle – usability engineering – Prototyping in practice – design rationale. Design rules – principles, standards, guidelines, rules. Evaluation Techniques – Universal Design.	11	
3.	Cognitive models –Socio-Organizational issues and stake holder requirements –Communication and collaboration models-Hypertext, Multimedia and WWW.	8	

4.	Mobile Ecosystem: Platforms, Application frameworks- Types of Mobile Applications: Widgets, Applications, Games- Mobile Information Architecture, Mobile 2.0, Mobile Design: Elements of Mobile Design, Tools.	8	
5.	Designing Web Interfaces – Drag & Drop, Direct Selection, Contextual Tools, Overlays, Inlays and Virtual Pages, Process Flow. Case Studies.	8	
6.	Recent Trends: Speech Recognition and Translation, Multimodal System	3	

Text book and Reference books:

1. Theodor Richardson, Charles N Thies, Secure Software Design, Jones & Bartlett
2. Kenneth R. van Wyk, Mark G. Graff, Dan S. Peters, Diana L. Burley, Enterprise Software Security,
Addison Wesley.

Course Outcomes:

On completion of the course students will be able to

1. Differentiate between various software vulnerabilities.
2. Software process vulnerabilities for an organization.
3. Monitor resources consumption in a software.
4. Interrelate security and software development process.

Pattern Recognition
Code: PEC-IT602D
Contact: 3L

Name of the Course:	**Pattern Recognition**	
Course Code: **PEC-IT602D**	Semester: VI	
Duration:6 months	Maximum Marks:100	
Teaching Scheme		**Examination Scheme**
Theory:3 hrs./week		Mid Semester exam: 15
Tutorial: NIL		Assignment and Quiz: 10 marks
		Attendance: 5 marks
Practical: NIL		End Semester Exam:70 Marks
Credit Points:	3	

Unit	Content	Hrs/Unit	Marks/Unit
1	Basics of pattern recognition	2	
2	**Bayesian decision theory 8L** Classifiers, Discriminant functions, Decision surfaces Normal density and discriminant functions Discrete features	8	
3	**Parameter estimation methods 6L** Maximum-Likelihood estimation Gaussian mixture models Expectation-maximization method Bayesian estimation	6	
4.	**Hidden Markov models for sequential pattern classification 8L** Discrete hidden Markov models Continuous density hidden Markov models	8	
5	**Dimension reduction methods 3L** 5.1. Fisher discriminant analysis 5.2Principal component analysis.	3	
	Parzen-window method K-Nearest Neighbour method		
6	Non-parametric techniques for density estimation	2	

7	**Linear discriminant function based classifier 5L** Perceptron Support vector machines	5	
8	**Non-metric methods for pattern classification 4L** Non-numeric data or nominal data Decision trees	4	
9	**Unsupervised learning and clustering 2L** Criterion functions for clustering Algorithms for clustering: K-means, Hierarchical and other methods	2	

Text book and Reference books:

1. R. O. Duda, P. E. Hart and D. G. Stork: Pattern Classification, John Wiley, 2001.
2. S. Theodoridis and K. Koutroumbas, Pattern Recognition, 4th Ed., Academic Press, 2009.
3. C. M. Bishop, Pattern Recognition and Machine Learning, Springer, 2006.

Numerical Methods
Code: OEC-IT601A
Contact: 3L

Name of the Course:	**Numerical Methods**	
Course Code: OEC-IT601A	Semester: VI	
Duration:6 months	Maximum Marks:100	
Teaching Scheme		**Examination Scheme**
Theory:3 hrs./week		Mid Semester exam: 15
Tutorial: NIL		Assignment and Quiz: 10 marks
		Attendance: 5 marks
Practical: NIL		End Semester Exam:70 Marks
Credit Points:	3	

Unit	Content	Hrs/Unit	Marks/Unit
1	Approximation in numerical computation: Truncation and rounding errors, Fixed and floating-point arithmetic, Propagation of errors.	2	
2	Interpolation: Newton forward/backward interpolation, Lagrange's and Newton's divided difference Interpolation.	8	

3	Numerical integration: Trapezoidal rule, Simpson's 1/3 rule, Expression for corresponding error terms.	3	
4.	Numerical solution of a system of linear equations: Gauss elimination method, Matrix inversion, LU Factorization method, Gauss-Seidel iterative method.	8	
5	Numerical solution of Algebraic equation: Bisection method, Regula-Falsi method, Newton-Raphson method.	3	
6	Numerical solution of ordinary differential equation: Euler's method, Runge-Kutta methods, Predictor-Corrector methods and Finite Difference method.	2	

Text book and Reference books:

1. R.S. Salaria: Computer Oriented Numerical Methods, Khanna Publishing House
2. C.Xavier: C Language and Numerical Methods.
3. Dutta & Jana: Introductory Numerical Analysis.
4. J.B.Scarborough: Numerical Mathematical Analysis.
5. Jain, Iyengar , & Jain: Numerical Methods (Problems and Solution).
6. Balagurusamy: Numerical Methods, Scitech.
7. Baburam: Numerical Methods, Pearson Education.
8. N. Dutta: Computer Programming & Numerical Analysis, Universities Press.

Human Resource Development and Organizational Behavior
Code: OEC-IT601 B
Contact: 3L

Name of the Course:	**Human Resource Development and Organizational Behavior**	
Course Code: **OEC-IT601 B**	Semester: VI	
Duration:6 months	Maximum Marks:100	
Teaching Scheme		**Examination Scheme**
Theory:3 hrs./week		Mid Semester exam: 15
Tutorial: NIL		Assignment and Quiz: 10 marks
		Attendance: 5 marks
Practical: NIL		End Semester Exam:70 Marks
Credit Points:	3	

Unit	Content	Hrs/Unit	Marks/Unit
1	Organizational Behaviour: Definition, Importance, Historical Background, Fundamental Concepts of OB, Challenges and Opportunities for OB. **[2]** Personality and Attitudes: Meaning of personality, Personality Determinants and Traits, Development of Personality, Types of Attitudes, Job Satisfaction.	4	
2	Perception: Definition, Nature and Importance, Factors influencing Perception, Perceptual Selectivity, Link between Perception and Decision Making. **[2]** 4. Motivation: Definition, Theories of Motivation - Maslow's Hierarchy of Needs Theory, McGregor's Theory X & Y, Herzberg's Motivation-Hygiene Theory, Alderfer's ERG Theory, McClelland's Theory of Needs, Vroom's Expectancy Theory.	8	
3	Group Behaviour: Characteristics of Group, Types of Groups, Stages of Group Development, Group Decision Making. **[2]** Communication: Communication Process, Direction of Communication, Barriers to Effective Communication. **[2]** Leadership: Definition, Importance, Theories of Leadership Styles.	4	
4.	Organizational Politics: Definition, Factors contributing to Political Behaviour. **[2]** Conflict Management: Traditional vis-a-vis Modern View of Conflict, Functional and Dysfunctional Conflict, Conflict Process, Negotiation – Bargaining Strategies, Negotiation Process. **[2]** Organizational Design: Various Organizational Structures and their Effects on Human Behaviour, Concepts of Organizational Climate and Organizational Culture.	8	

Text book and Reference books:

1. Robbins, S. P. & Judge, T.A.: Organizational Behavior, Pearson Education, 15th Edn.
2. Luthans, Fred: Organizational Behavior, McGraw Hill, 12th Edn.

3. Shukla, Madhukar: Understanding Organizations – Organizational Theory & Practice in India, PHI
4. Fincham, R. & Rhodes, P.: Principles of Organizational Behaviour, OUP, 4th Edn.
5. Hersey, P., Blanchard, K.H., Johnson, D.E.- Management of Organizational Behavior Leading Human Resources,
PHI, 10th Edn.

Research Methodology
Code: PROJ- CS601
Contact: 3L

Name of the Course:	**Research Methodology**	
Course Code: **PROJ- CS601**	Semester: VI	
Duration:6 months	Maximum Marks:100	
Teaching Scheme		**Examination Scheme**
Theory:3 hrs./week		Mid Semester exam: 15
Tutorial: NIL		Assignment and Quiz: 10 marks
		Attendance: 5 marks
Practical: NIL		End Semester Exam:70 Marks
Credit Points:	3	

Unit	Content	Hrs/Unit	Marks/Unit
1	**RESEARCH FORMULATION AND DESIGN** Motivation and objectives – Research methods vs. Methodology. Types of research – Descriptive vs. Analytical, Applied vs. Fundamental, Quantitative vs. Qualitative, Conceptual vs. Empirical, concept of applied and basic research process, criteria of good research. Defining and formulating the research problem, selecting the problem, necessity of defining the problem, importance of literature review in defining a problem, literature review-primary and secondary sources, reviews, monograph, patents, research databases, web as a source, searching the web, critical literature review, identifying gap areas from literature and research database, development of working hypothesis.	9	
2	**DATA COLLECTION AND ANALYSIS** Accepts of method validation, observation and collection of data, methods of data collection, sampling methods, data processing and analysis strategies and tools,data analysis with statically package (Sigma STAT,SPSS for student t-test, ANOVA, etc.), hypothesis testing.	9	

3	**RESEARCH ETHICS, IPR AND SCHOLARY PUBLISHING** Ethics-ethical issues, ethical committees (human & animal); IPR- intellectual property rights and patent law, commercialization, copy right, royalty, trade related aspects of intellectual property rights (TRIPS); scholarly publishing- IMRAD concept and design of research paper, citation and acknowledgement, plagiarism, reproducibility and accountability.	9	
4.	**INTERPRETATION AND REPORT WRITING** Meaning of Interpretation, Technique of Interpretation, Precaution in Interpretation, Significance of Report Writing, Different Steps in Writing Project Report, Layout of the Project/Research Report, Types of Reports, Oral Presentation, Mechanics of Writing a Project/Research Report, Precautions for Writing Research Reports, Conclusions.	9	

Text book and Reference books:

1. Garg, B.L., Karadia, R., Agarwal, F. and Agarwal, U.K., 2002. An introduction to Research Methodology, RBSA Publishers.
2. Kothari, C.R., 1990. Research Methodology: Methods and Techniques. New Age International. 418p.
3. Sinha, S.C. and Dhiman, A.K., 2002. Research Methodology, Ess Ess Publications. 2 volumes.
4. Trochim, W.M.K., 2005. Research Methods: the concise knowledge base, Atomic Dog Publishing. 270p.
5. Wadehra, B.L. 2000. Law relating to patents, trade marks, copyright designs and geographical indications. Universal Law Publishing.

Additional reading

1. Anthony, M., Graziano, A.M. and Raulin, M.L., 2009. Research Methods: A Process of Inquiry, Allyn and Bacon.
2. Carlos, C.M., 2000. Intellectual property rights, the WTO and developing countries: the TRIPS agreement and policy options. Zed Books, New York.
3. Coley, S.M. and Scheinberg, C. A., 1990, "Proposal Writing", Sage Publications.
4. Day, R.A., 1992.How to Write and Publish a Scientific Paper, Cambridge University Press.
5. Fink, A., 2009. Conducting Research Literature Reviews: From the Internet to Paper. Sage Publications
6. Leedy, P.D. and Ormrod, J.E., 2004 Practical Research: Planning and Design, Prentice Hall.
7. Satarkar, S.V., 2000. Intellectual property rights and Copy right. Ess Ess Publications.

PRACTICAL SYLLABUS

Database Management System Lab
Code: PCC-CS691
Contacts: 4P

Name of the Course:	**Database Management System Lab**
Course Code: PCC-CS691	Semester: VI
Duration:6 months	Maximum Marks:100
Teaching Scheme:	
Theory: hrs./week	Continuous Internal Assessment
Tutorial: NIL	External Assesement:60
Practical: 4 hrs./week	Distribution of marks:40
Credit Points:	2

Laboratory Experiments:

Structured Query Language

1. Creating Database

- Creating a Database
- Creating a Table
- Specifying Relational Data Types
- Specifying Constraints
- Creating Indexes

2. Table and Record Handling

- INSERT statement
- Using SELECT and INSERT together
- DELETE, UPDATE, TRUNCATE statements
- DROP, ALTER statements

3. Retrieving Data from a Database

1. The SELECT statement
2. Using the WHERE clause
3. Using Logical Operators in the WHERE clause
4. Using IN, BETWEEN, LIKE , ORDER BY, GROUP BY and HAVING

Clause

5. Using Aggregate Functions
6. Combining Tables Using JOINS
7. Subqueries

4. Database Management

- Creating Views
- Creating Column Aliases
- Creating Database Users
- Using GRANT and REVOKE

Cursors in Oracle PL / SQL **Writing Oracle PL / SQL Stored Procedures**

Any experiment specially designed by the college
(Detailed instructions for Laboratory Manual to be followed for further guidance)

Computer Networks Lab
Code: PCC-CS692
Contacts: 4P

Name of the Course:	Computer Networks Lab
Course Code: PCC-CS692	Semester:VI
Duration:6 months	Maximum Marks:100
Teaching Scheme:	
Theory: hrs./week	Continuous Internal Assessment
Tutorial: NIL	External Assesement:60
Practical: 4 hrs./week	Distribution of marks:40
Credit Points:	2

Laboratory Experiments:

1) NIC Installation & Configuration (Windows/Linux)
2) Understanding IP address, subnet etc
Familiarization with
- Networking cables (CAT5, UTP)
- Connectors (RJ45, T-connector)
- Hubs, Switches

3) TCP/UDP Socket Programming
- Simple, TCP based, UDP based
- Multicast & Broadcast Sockets
- Implementation of a Prototype Multithreaded Server

4) Implementation of
□□Data Link Layer Flow Control Mechanism (Stop & Wait, Sliding Window)
□□Data Link Layer Error Detection Mechanism (Cyclic Redundancy Check)
□□Data Link Layer Error Control Mechanism (Selective Repeat, Go Back N)
5) Server Setup/Configuration
FTP, TelNet, NFS, DNS, Firewall

Any experiment specially designed by the college
(Detailed instructions for Laboratory Manual to be followed for further guidance)