SCHEME OF INSTRUCTION & EXAMINATION
B.E. IV YEAR (COMPUTER SCIENCE & ENGINEERING)
Proposed scheme and syllabus with effect from the Academic year 2014-2015

SEMESTER - II

Sl. No.	Syllabus Ref. No.	SUBJECT	Scheme of Instruction		Scheme of Examination			
			Periods per week		Duration In Hours	Maximum Marks		
			L/T	D/P		Univ. Exam	Sessionals	Credits
		THEORY						
1	CS451 UE	Embedded Systems	4	-	3	75	25	4
2		Elective-III	4	-	3	75	25	4
3		Elective-IV	4	-	3	75	25	4
		PRACTICALS						
1	CS481 UE	Embedded Systems Lab	-	3	3	50	25	2
2	CS482 UE	Seminar	-	3	-	-	25	2
3	CS483UE	Project	-	6	Viva Voce	*Grade	50	12
		TOTAL	12	12		275	175	28

Elective – III

CS 452 UE Natural Language Processing
CS 453 UE Neural Networks
CS 454 UE Machine Learning
CS 455 UE Software Quality and Testing
CS 456 UE Soft Computing
CS 457 UE Web Service Architecture
CS 458 UE Data Mining
BM 452 UE Medical Image Processing

Elective-IV

CS 461 UE Advanced Databases
CS 462 UE Image Processing
CS 463 UE Human Computer Interaction
CS 464 UE Cloud Computing
BM 454UE Bio Electricity
CE 454 UE Disaster Management
ME 460 UE Robotics
LA 454 UE Intellectual Property Rights

***Grade : S/A/B/C/D/E**

SCHEME OF INSTRUCTION & EXAMINATION
B.E. IV YEAR (COMPUTER SCIENCE & ENGINEERING)
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SERVICE COURSES OFFERED TO OTHER DEPARTMENTS

SEMESTER - II

SL. No.	Syllabus Ref. No.	SUBJECT	Scheme of Instruction		Scheme of Examination			
			Periods per week		Duration In Hours	Maximum Marks		
			L/T	D/P		Univ. Exam	Sessionals	Credits
		THEORY						
1.	CS459 UE	Information Security (Elective-III)	4		3	75	25	4
2.	CS 458 UE	Data Mining (Elective – IV)	4		3	75	25	4

CS 451 UE With effect from the academic year 2014-2015

EMBEDDED SYSTEMS

Instruction	4 Periods per week
Duration of University Examination	3 Hours
University Examination	75 Marks
Sessional	25 marks
Credits	4

Course Objectives:

- To understand the general purpose of Embedded System Development.
- To be able to use ANSI C to develop Embedded Software.
- To develop Prototype Circuit on Board (Interfacing to Microcontroller).
- To teach interface to peripherals, knowledge of typical Interfacing standards.
- To design Real Time Embedded systems using the concepts of RTOS.

Course Outcomes:

- Students will understand the significance of Embedded Systems.
- Students will be in a position to develop software for any special case.
- Students will get expertise in various development tools.

UNIT- I

Introduction to Embedded Systems, Characteristics and quality attributes of embedded systems, Challenges in Embedded System Design, Application and Domain specific embedded systems.

UNIT –II

Embedded System Architecture: Hardware Architecture, and Communication Interfaces.
Software Architecture: Architecture of Embedded in commission Systems, Categories of Embedded Operating Systems, Application Software, Communication Software.

UNIT-III

Programming for Embedded Systems: Overview of ANSI C, Bit Manipulation using C, Memory Management, Device Drivers, Code Optimization, Productivity Tools, and C Coding.

UNIT-IV

Operating System for Embedded System: Real time operating systems based embedded system design, Introduction to embedded systems design with Micro C/OS- II and Vx Works.
Representative Embedded Systems: Digital Thermometer, Handheld Computer, Navigation System, IP Phone, Software-defined Radio, Smart Cards, and RF Tags.

UNIT –V

Embedded Systems development Environment: IDE, Cross compilation, Disassembler, Simulators, Emulators and Debugging, Target hardware debugging, and Boundary Scan.
Product enclosure design and development tools, Embedded Product Development life cycle- Different phases and approaches of EDLC. Trends in embedded industry.

Suggested Reading:

1. Shibu K V, "*Introduction to Embedded Systems*", Tata McGraw Hill, 2010.
2. Dr K.V.K.K. Prasad, "*Embedded/Real time Systems: Concepts, Design and Programming*", Dreamtech Press, 2014
3. Raj Kamal, " *Embedded systems Architecture, Programming & Design*", Tata McGraw Hill, 2010.

CS 481 UE With effect from the academic year 2014-2015

EMBEDDED SYSTEMS LAB

Instruction	3 Periods per week
Duration of University Examination	3 Hours
University Examination	50 Marks
Sessional	25 Marks
Credits	4

Course Objectives:

- To develop knowledge in programming techniques using embedded C language.
- To develop programming skill in understanding the interfacing techniques.
- To gain practical knowledge in scheduling and multitasking issues for Embedded Systems.

1. Programs using Embedded C
2. Experiments to interface and to access all internal and external peripherals such as
    a. Stepper motor interface.
    b. LCD interface.
    c. LED interface.
    d. Keyboard interface.
    e. Serial and DAC system interface
3. Experiments on RTOS Applications using VxWorks
4. Practical implementation concepts of RTOS
    - Scheduling
    - Multiple Processes

CS 482 UE With effect from the academic year 2014-2015

SEMINAR

Instruction	3 Periods per week
Sessional	25 Marks
Credits	2

Course Objectives:

- To train and provide hands-on experience in analysis, design, and programming of information systems by means of case studies and projects.
- To expose the students to industry practices and team work.
- To provide training in soft skills and also train them in presenting seminars and technical report writing.

Oral presentation is an important aspect of engineering education. The objective of the Seminar Course is to motivate a student to do a systematic and independent study of state-of-topics in a board area of his/her interest.
Seminar topics may be chosen by the student with the suggestions from the family members. Students are to be exposed to following aspects of seminar presentation.
Students are to be exposed to following aspects of seminar presentations.

- Literature survey
- Organization of material to be presented
- Preparation of power point Presentation
- Technical writing

Each student is required to

1. Submit one page synopsis of the seminar talk for display on notice board of the department.
2. Give a 20 minutes presentation with the aid of a PC, followed by a 10 minutes discussion.
3. Submit the report on the seminar topic presented along with list of reference and slides used.

Seminar is to be scheduled from the third week to the last week of the semester and any change in schedule should be discouraged.

Sessional marks will be awarded jointly or independently by at least two faculty members. The award will be on the basis of the oral presentation made, written materials submitted, active participation of the student in the proceedings as well as involvement in the discussions.

CS 483 UE With effect from the academic year 2014-2015

PROJECT

Instruction	3 Periods per week
Duration of University Examination	Viva Voce
University Examination	Grade*
Sessional	50 Marks
Credits	12

Course Objectives:

- To train and provide hands-on experience in analysis, design, and programming of information systems by means of case studies and projects.
- To expose the students to industry practices and team work.
- To provide training in soft skills and also train them in presenting seminars and technical report writing.

'Solving a real life problem' should be the focus of U.G. projects. Faculty members should propose the project briefs (scope and references) well in advance which should be made available to the students at the department library. The project should be classified as hardware, software, modeling simulation. It should involve one or many elements of techniques such as analysis, design synthesis.

The department will appoint a project coordinator who will coordinate the following:

Grouping of students (max 3 in a group)
Allotment of project and project guides
Project monitoring at regular intervals

All projects allotment is to be completed by the 2^{nd} week of 4^{th} year 1^{st} semester so that students get sufficient time for completion of the project.

All projects will be monitored at least twice in a semester through student presentation. Sessional marks are to be based on the grades /Marks, awarded by a monitoring committee comprising of faculty members as well as by the supervisor.

Efforts should be made that some of the projects are carried out in industries with the help of industry coordinators. Problems can also be invited from the industries to be worked out through UG projects.

Common norms will be established for the final documentation of the project report by the respective departments.

***S/A/B/C/D/E**

Note: Three periods of contact load will be assigned to each project guide.

CS 452 UE With effect from the academic year 2014-2015

NATURAL LANGUAGE PROCESSING
(ELECTIVE-III)

Instruction	4 Periods per week
Duration of University Examination	3 Hours
University Examination	75 Marks
Sessional	25 marks
Credits	4

Course Objectives:

- To provide basics of probability and information theory.
- To learn linguistic concepts and use of corpora
- To gain knowledge of statistical inference and word sense disambiguation
- To provide an understanding of HMM and its use in POS tagging
- To study the concepts of PCFG
- To learn about applications in information retrieval

UNIT-I
Introduction
Elementary Probability Theory
Essential Information Theory

UNIT II
Linguistic Essentials, Corpus-Based Work

UNIT III
Collocations.
Statistical Inference: Bins: Forming Equivalence Classes, Reliability vs. discrimination, n-gram models, Building n-gram models, An Information Theoretic Approach.
Word Sense Disambiguation**:** Methodological Preliminaries, Supervised and unsupervised learning, Pseudo words, Upper and lower bounds on performance, Supervised Disambiguation, Bayesian classification.

UNIT IV
Evaluation Measures, Markov Models**:** Hidden Markov Models, Use, General form of an HMM
Part-of-Speech Tagging

UNIT V
Probabilistic Context Free Grammars: Introduction, Clustering
Information Retrieval: Background, The Vector Space Model

Suggested Reading:

1. Christopher D. Manning, Hinrich Schutze, *Foundations of Statistical Natural Language Processing*, The MIT Press, 1999.
2. James Allan, *Natural Language Understanding*, Pearson Education, 1994
3. Tanveer Siddiqui, US Tiwary, *Natural Language Processing and Information Retrieval*, Oxford University Press, 2008

CS 453 UE With effect from the academic year 2014-2015

NEURAL NETWORKS
(ELECTIVE-III)

Instruction	4 Periods per week
Duration of University Examination	3 Hours
University Examination	75 marks
Sessional	25 marks
Credits	4

Course Objectives:

- To provide an understanding of the emergence of neural networks.
- To study the learning process.
- To gain knowledge of single and multi layer perceptrons.
- To learn Hopfield model and self organizing maps

UNIT I

Expert Systems, Introduction to Neural Networks, Human brain, Models of a Neuron, Neural Networks viewed as directed graphs, feedback, Network Architecture, Knowledge representation, Artificial Intelligence and Neural Networks, Expert system Vs Neural networks.

UNIT II

Learning Process: Introduction, Error detection learning, Memory based learning ,Hebbian Learning, Competitive learning, Boltzman Learning, Credit assignment problem, Learning with a teacher, Learning without a teacher.

UNIT III

Single layer perceptrons: Introduction, Least mean square algorithm. Learning curves, Learning rate annealing schedule, Perceptron, Perceptron convergence theorem.

UNIT IV

Multilayer perceptron: Introduction, Back-propagation Algorithm, Summary of the Back-propagation algorithm. XOR problem, Heuristics for making the Back-propagation algorithm perform better.

UNIT V

Hopfield Model, Self –organizing maps: Introduction, Kohonen's model, Neural Network applications.

Suggested Reading:

1. Simon Haykin:"*Neural Networks-Comprehensive foundation* " Pearson Education, 2nd Edition,2001.

2. Limin FU, "*Neural Networks in Computer Intelligence*", Tata McGraw Hill publications, 2003

MACHINE LEARNING
(ELECTIVE-III)

Instruction	4 Periods per week
Duration of University Examination	3 Hours
University Examination	75 Marks
Sessional	25 marks
Credits	4

Course Objectives:

- To provide basics of machine learning
- To train the students in both supervised and unsupervised learning techniques
- To expose the students to dimensionality reduction

UNIT-I

Introduction: Learning, Types of Machine Learning.
Concept learning: Introduction, Version spaces and the candidate elimination algorithm.
Learning with Trees: Constructing Decision Trees, CART, Classification Example

UNIT-II

Linear Discriminants: The Perceptron, Linear Separability, Linear Regression
Multilayer Perceptron (MLP): Going Forwards, Backwards, MLP in practices, Deriving back propagation
Support Vector Machines: Optimal Separation, Kernels

UNIT-III

Some Basic Statistics: Averages, Variance and Covariance, The Gaussian, The Bias-Variance Tradeoff
Bayesian learning: Introduction, Bayes theorem, Bayes Optimal Classifier, Naïve Bayes Classifier.
Graphical Models: Bayesian networks, Approximate Inference, Making Bayesian Networks, Hidden Markov Models, The Forward Algorithm.

UNIT-IV

Evolutionary Learning: Genetic Algorithms, Genetic Operators, Genetic Programming
Ensemble learning: Boosting, Bagging
Dimensionality Reduction: Linear Discriminant Analysis, Principal Component Analysis

UNIT-V

Clustering: Introduction, Similarity and Distance Measures, Outliers, Hierarchical Methods, Partitional Algorithms, Clustering Large Databases, Clustering with Categorical Attributes, Comparison

Suggested Reading:

1. Tom M. Mitchell. *Machine Learning* , Mc Graw Hill, 1997
2. Stephen Marsland. *Machine Learning - An Algorithmic Perspective*. CRCPress, 2009
3. Margaret H Dunham. *Data Mining*. Person Edition., 2003
4. Galit Shmueli, Nitin R Patel, Peter C Bruce, *Data Mining for Business Intelligence*, Wiley India Edition, 2007
5. Rajjan Shinghal, *Pattern Recognition*, Oxford University Press, 2006

SOFTWARE QUALITY & TESTING
(ELECTIVE-III)

Instruction	4 Periods per week
Duration of University Examination	3 Hours
University Examination	75 Marks
Sessional	25 marks
Credits	4

Course Objectives:

- To introduce concepts of software quality
- To expose the students to the use of tools in quality and defect removal
- To inculcate the importance of testing using different approaches
- To expose the students to various processes and practices in software quality assurance

Course Outcomes:

Students will learn:

- How to write a useful test plan
- How to construct test cases
- How to evaluate completeness of testing
- Importance of software quality in software development phases
- Importance of different standards and metrics for quality assurance.

UNIT - I

The Software Quality Challenge, Introduction Software Quality Factors, The Components of the Software Quality Assurance System – Overview, Development and Quality Plans.

UNIT - II

Integrating Quality Activities in the Project Life Cycle, Assuring the Quality of Software Maintenance Components, CASE Tools and their effect on Software Quality, Procedure and Work Instructions, Supporting Quality Devices, Configuration Management, Documentation Control, Project Progress Control.

UNIT - III

Software Quality Metrics, Costs of Software Quality, Quality Management Standards - ISO 9000 and Companion ISO Standards, CMM, CMMI, PCMM, Malcom Balridge, 3 Sigma, 6 Sigma, SQA Project Process Standards – IEEE Software Engineering Standards.

UNIT - IV

Building a Software Testing Strategy, Establishing a Software Testing Methodology, Determining Your Software Testing Techniques, Eleven – Step Software Testing Process Overview, Assess Project Management Development Estimate and Status, Develop Test Plan, Requirements Phase Testing, Design Phase Testing, Program Phase Testing, Execute Test and Record Results, Acceptance Test, Report Test Results, Test Software Changes, Evaluate Test Effectiveness.

UNIT - V

Testing Client / Server Systems, Testing the Adequacy of System Documentation, Testing Web-based Systems, Testing Off – the – Shelf Software, Testing in a Multiplatform Environment, Testing Security, Testing a Data Warehouse, Creating Test Documentation, Software Testing Tools, Taxonomy of Testing Tools, Methodology to Evaluate Automated Testing Tools, Load Runner, Win Runner and Rational Testing Tools, Java Testing Tools, JMetra, JUNIT and Cactus.

Suggested Reading:

1. Daniel Galin, *Software Quality Assurance – From Theory to Implementation*, Pearson Education
2. Mordechai Ben – Menachem / Garry S.Marliss, *Software Quality – Producing Practical, Consistent Software*, Cengage Learning
3. William E. Perry, *Effective Methods for Software Testing*, 2nd Edition, Wiley & Sons.
4. Srinivasan Desikan, Gopalaswamy Ramesh, *Software Testing, Principles and Practices*, Pearson Education.
5. Dr.K.V.K.K. Prasad, *Software Testing Tool*, Wiley Publishers

Web Resources :

1. http://www.sei.cmu.edu/cmmi/
2. www.ibm.com/**software**/awdtools/**test**er/functional/index.html
3. www.ibm.com/**software**/awdtools/**test**/manager/
4. java-source.net/open-source/testing-tools
5. www.junit.org
6. java-source.net/open-source/web-testing-tools

CS 456 UE With effect from the academic year 2014-2015

SOFT COMPUTING
(ELECTIVE-III)

Instruction	4 Periods per week
Duration of University Examination	3 Hours
University Examination	75 Marks
Sessional	25 marks
Credits	4

Course Objectives:

- To provide a thorough understanding of neural networks
- To study fuzzy logic and its applications
- To gain knowledge of genetic algorithms and their applications

UNIT-I
Introduction
ANN: An Introduction
Supervised Learning Network

UNIT-II
Unsupervised Learning Networks

UNIT-III
Introduction to Classical Sets and Fuzzy Sets
Classical Relations and Fuzzy Relations
Membership functions

UNIT-IV
Fuzzy Arithmetic and Fuzzy Measures
Fuzzy Rule Base and Approximate Reasoning
Fuzzy Decision making
Fuzzy Logic Control Systems

UNIT-V
Genetic Algorithm
Applications: Optimization of TSP, Internet Search Technique

Suggested Reading:

1 S N Sivanandam, S N Deepa, *Principles of Soft Computing*, Wiley India Edition, 2007
2 Fakhreddine O Karray, Clarence D Silva, *Soft Computing and Intelligent System Design*. Pearson Edition, 2004

CS 457 UE With effect from the academic year 2014-2015

WEB SERVICE ARCHITECTURE
(ELECTIVE-III)

Instruction	4 Periods per week
Duration of University Examination	3 Hours
University Examination	75 Marks
Sessional	25 marks
Credits	4

Course Objectives:

- To provide basics of SOA and Web Services.
- To study the SOA and WS-* Extensions
- To study service orientation
- To gain knowledge of all the phases in building of an SOA.

UNIT I:
SOA and Web Services Fundamentals: Introducing So, The Evolution of SOA, Web services and primitive SOA.

UNIT II:
SOA and WS-*Extensions: Web Services and Contemporary SOA(I: Activity Management and Composition), Web Services and Contemporary SOA(II: Advanced Messaging, Metadata, and Security).

UNIT III:
SOA and Service-Orientation: Principles of Service-Orientation, Service Layers.

UNIT IV:
Building SOA (Plannning And Analysis) : SOA Delivery Strategies, Services-Oriented Analysis (I: Introduction), Service-Oriented Analysis (II: Service Modeling).

UNIT V:
Building SOA (Technology and Design): Service-Oriented Design (I: Introduction), Service-Oriented Design (II: SOA Composition Guidelines), Service-Oriented Design (III: Service-Design), Service-oriented Design (IV: Business Process Design), Fundamentals WS-*Extensions, SOA Platforms.

Suggested Readings

1. Thomas Eri*,"Service-Oriented Architecture(SOA): Concepts, Technology, and Design*", Prentice Hall PTR, 2005
2. James McGovern and Sameer Tyagi , "*Java Web Services Architecture*,", Morgan Kaufmann-May 2003.

CS 458 UE With effect from the academic year 2014-15

DATA MINING
(ELECTIVE-IV for CSE/BME/ECE/EE/CE/ME)

Instruction	4 Periods per week
Duration of University Examination	3 Hours
University Examination	75 Marks
Sessional	25 marks
Credits	4

Course Objectives:

- To understand the different steps in data mining
- To learn the different classification techniques
- To gain knowledge of association rule mining
- To understand the techniques of clustering

UNIT-I

Introduction: Challenges – Origins of Data Mining and Data Mining Tasks

Data: Types of Data – Data Quality – Data Preprocessing – Measures of Similarity and Dissimilarity – OLAP and Multidimensional Data Analysis

UNIT-II

Classification: Preliminaries – General approach to solving a classification problem – Decision tree induction – Model overfitting – Evaluating the performance of a classifier – Methods of comparing classifiers - Rule-based classifier

UNIT-III

Classification: Nearest-Neighbor classifiers – Bayesian classifiers – Artificial Neutral Networks – Support vector machine – Ensemble methods – Class imbalance problem – Multiclass problem

UNIT-IV

Association Analysis: Problem definition – Frequent item set generation – Rule generation – Compact representation of frequent item sets – Alternative methods for generating frequent item sets – FP-Growth Algorithm – Evaluation of association patterns – Effect of Skewed support distribution – Handling categorical attributes – Handling continuous attributes – Handling a concept hierarchy

UNIT-V

Cluster Analysis: Overview – K-means – Agglomerative hierarchical clustering – DBSCAN – Cluster evaluation – Characteristics of Data, Clusters, and Clustering Algorithms

Suggested Reading:

1. Pang-Ning Tan, Michael Steinbach, Vipin Kumar, *Introduction to Data Mining*, Pearson Education, 2008.
2. K.P.Soman, Shyam Diwakar, V.Ajay, *Insight into Data Mining Theory and Practice*, PHI, 2010.
3. Arun K Pujari, *Data Mining Techniques*, University Press, 2nd Edn, 2009.
4. Vikram pudi P. Radha Krishna , *Data Mining*, Oxford University Press, 1st Edition 2009
5. Galit S, Nitin RP, Peter C Bruce. *Data Mining for Business Intelligence*. Wiley India Edition. 2007

BM 452UE With effect from the academic year 2014-15

MEDICAL IMAGE PROCESSING
(ELECTIVE-III- CSE/ECE/EEE)

Instruction	4 Periods per week
Duration of University Examination	3 Hours
University Examination	75 Marks
Sessional	25 marks
Credits	4

UNIT-I

Fundamentals**:** Digital image, Elements of digital geometry, Components of DIP, Visual detail. Visual preliminaries- Brightness adaptation and Contrast, Acuity and contour, Texture and pattern discrimination, Shape detection and recognition, Perception of color. Image formation- Geometric Model and Photometric Model, medical applications

UNIT-II

Image enhancement: Spatial Domain Methods –Binary Image, Negative of an Image, Log Transformations, Power law Transformation, contrast enhancement, Histogram equalization, Spatial Domain Filters-Smoothing filters, Sharpening filters.

Frequency Domain Methods- Steps for filtering in the frequency domain, Convolution theorem, Smoothing filters, Sharpening filters, Homomorphic filtering. medical applications

UNIT-III

Image restoration: A model of the image degradation, noise models, restoration in the presence of noise-spatial filtering, periodic noise reduction by frequency domain filtering, linear & position-invarient degradations, estimating the degradation function, inverse filtering, wiener filtering, constrained least squares filtering, geometric mean filter, medical applications

UNIT-IV

Segmentation: Points detection, line detection, edge detection methods, Histogram based image segmentation, segmentation using split and merge method, region growing method, watershed method, k-means clustering method, self-similar fractal method, comparison of all the methods, medical applications.

UNIT-V

Representation, description and recognition: Representation, boundary descriptors, regional descriptors, principal component analysis, relational descriptors. Recognition based on decision-theoretic and structural methods, medical applications.

Suggested Reading :

1 R.C Gonzalez and R.E. Woods, "*Digital Image Processing*", 2nd Ed, Prentice Hall. 2002.

2 Anil K. Jain, "*Fundamentals of Image Processing"*, Prentice Hall, Englewood clifs, New Jersey,1989

3.G.R.Sinha and Bhagavathi Charan Patel, "*Medical Image Processing concepts and Applications"*,PHI,2014

4. Chanda&Majumdar, "*Digital Image Processing and Analysis",* Second Edition PHI, 2013.

CS 461 UE With effect from the academic year 2014-2015

ADVANCED DATABASES
(ELECTIVE-IV)

Instruction	4 periods per week
Duration of University Examination	3 hours
University Examination	75Marks
Sessional	25 Marks
Credits	4

Course Objectives:

- To understand the object oriented concepts in databases
- To optimize the query processing on databases
- To learn the advanced databases like parallel, distributed, spatial and temporal

UNIT-I

Object Based Databases: Overview, Complex Data Types, Structured Types and Inheritance in SQL, Table Inheritance, Array and Multiset Types in SQL, Object-Identity and Reference Types in SQL, Implementing O-R features, Persistent Programming Languages, Object-Relational Mapping, Object-Oriented versus Object-Relational.

UNIT-II

XML: Motivation, Structure of XML data, XML Document Schema, Querying and Transformation, Application Program Interface to XML, Storage of XML data, XML applications.

UNIT-III

Query Processing: Overview, Measures of Query Cost, Selection Operation, Sorting, Join Operation, Other Operations, Evaluation of Expressions.

Query Optimization: Overview, Transformation of Relational Expressions, Estimating Statistics of Expression Results, Choice of Evaluation Plans, Materialized Views.

UNIT-IV

Parallel Databases: Introduction, I/O Parallelism, Interquery Parallelism, Intraquery Parallelism, Intraoperation Parallelism, Interoperation Parallelism, Query Optimization, Design of Parallel Systems.

Distributed Databases : Homogeneous and Heterogeneous Database, Distributed Data Storage, Distributed Transactions, Commit Protocols, Concurrency Control in Distributed Databases, Availability, Distributed Query Processing, Heterogeneous Distributed Databases, Cloud-Based Databases, Directory Systems.

UNIT-V

Advanced Application Development: Performance Tuning, Performance Benchmarks, Other Issues in Application Development, Standardization.

Spatial and Temporal Data and Mobility: Motivation, Time in Databases, Spatial and Geographic Data, Multimedia Databases, Mobility and Personal Databases.

Suggested Reading :

1. Abraham Silberschatz, Henry F Korth, S Sudarshan, "*Database System Concepts*", McGraw Hill International Edition, Sixth Edition, 2009.
2. Elmasri Navathe, Somayajulu, Gupta "*Fundamentals of Database Systems*", Pearson Education, Fourth Edition, 2006.
3. CJ Date, A Kannan, S Swamynathan, "*An Introduction to Database Systems*", Pearson Education, Eighth Edition, 2006.
4. Ramakrishna, Gehrke, "*Database Management Systems*", McGraw-Hill International Edition, Third Edition, 2003.

CS 462 UE With effect from the academic year 2014-2015

IMAGE PROCESSING
(ELECTIVE-IV)

Instruction	4 Periods per week
Duration of University Examination	3 Hours
University Examination	75 marks
Sessional	25 marks
Credits	4

Course Objectives:

- To introduce basic image formation & representation of digital images
- To teach various image transformation, enhancement and segmentation techniques
- To impart image encoding and image restoration techniques

Course Outcomes:

- The student can understand the fundamentals of Digital Image Processing (DIP) and also significance of DIP
- The student will be in a position to apply the various techniques in DIP like Image smoothing/ sharpening, Image compression etc. whenever required.
- The course enables the student to do research in the field of DIP.
- To impart image encoding and image restoration techniques

UNIT I

Image Processing: Introduction, Examples, Fundamental steps, Components, Elements of visual perception, Light and Electromagnetic Spectrum, Image sensing and Acquisition, Image Sampling and Quantization, Basic relationships between pixels.

Intensity Transformations and Spatial Filtering: Background, Some basic intensity transformation functions, Histogram processing, Fundamentals of Spatial filtering, Smoothing spatial filters, Sharpening spatial filters, Combining Spatial Enhancement Methods.

UNIT II

Filtering in the Frequency Domain: Background, Preliminary concepts, Sampling and Fourier Transform of Sampled Functions, Discrete Fourier Transform (DFT) of one variable, Extension to functions of two variables, Some Properties of the 2-D Discrete Fourier Transform, Basics of Filtering in the Frequency Domain, Image Smoothing, Image Sharpening, Homomorphic Filtering.

Image Restoration: Noise Models, Restoration in the presence of noise only-Spatial Filtering, Periodic Noise Reduction by Frequency Domain Filtering.

Linear Degradation, Position-invariant Degradation, Estimating the Degradation Function, Inverse Filtering, Minimum Mean Square Error Filtering, Constrained Least Squares Filtering, Geometric Mean Filter.

UNIT III

Color Image Processing: Color fundamentals, Color models, Pseudocolor Image Processing, Basics of Full-color Image Processing, Color Transformations, Smoothing and Sharpening, Color-based Image Segmentation, Noise in Color Images, Color Image Compression.

Wavelets and Multi resolution Processing: Background, Multiresolution Expansions, Wavelet Transforms in One Dimension, The Fast Wavelet Transform, Wavelet Transforms in Two Dimensions, Wavelet Packets.

UNIT IV

Image Compression: Fundamentals, Image Compression Models, Elements of Information Theory, Error- free Compression, Lossy Compression, Image Compression Standards, Some Basic Compression Methods.

Morphological Image Processing: Preliminaries, Erosion and Dilation, Opening and Closing, The Hit-or-Miss Transformation, Some Basic Morphological Algorithms, Some Basic Gray-Scale Morphological Algorithms.

UNIT V

Image Segmentation: Fundamentals, Point, Line and Edge Detection, Thresholding, Region-based Segmentation, Segmentation using Morphological Watersheds, The use of Motion in Segmentation.

Object Recognition: Patterns and Pattern Classes, Recognition based on Decision-theoretic Methods, Structural Methods.

Suggested Reading:

1. Rafael C. Gonzalez and Richard E. Woods, "*Digital Image Processing*", 3rd Edition, PHI Learning Pvt. Limited, 2008
2. William K. Pratt, "*Digital Image Processing*", 3rd Edition, John Wiley & Sons, Inc., 2001

CS 463 UE With effect from the academic year 2014-2015

HUMAN COMPUTER INTERACTION
(ELECTIVE IV)

Instruction	4 Periods per week
Duration of University Examination	3 Hours
University Examination	75 Marks
Sessionals	25 Marks
Credits	4

Course Objectives:

- To provide basics of HCI.
- To learn the design of various user interfaces.
- To learn the role of feedback and internationalization
- To provide basics of graphics
- To understand Interaction design, prototyping, testing and evaluation

UNIT-I

Importance of the user interface-definition, importance of good design, brief history. Characteristics of graphical & web user interfaces-GUI, WUI, principles of interface design.

User interface design process. Knowing the client-understanding how people interact, important human characteristics, human considerations. Principals of good screen design-human considerations in screen design. Develop System menus & Navigation schemes-structures, functions, content, formatting, phrasing, choices and graphical menus.

UNIT-II

Select the proper Kinds of Windows-characteristics, components, presentation styles, types, management, organizing functions, operations. Device based controls-characteristics, selection. Screen based controls-operable, text entry/read-only, selection, combination entry/selection, and other operable controls, presentation controls, selection of proper controls. Write clear Text & Messages.

UNIT-III

Provide effective Feedback and guidance & Assistance. Provide effective Internationalization and Accessibility. Create meaningful Graphics, icons and images. Choose the proper Colors. Organize and Layout windows and pages.

UNIT-IV

Interaction Design-Introduction, goals, Conceptualizing usability. Conceptualization of interaction-Problem space, Conceptual models, interface metaphors, interaction paradigms. Understand users-Cognition, conceptual frameworks for cognition. Collaboration and communication- Social mechanisms, Conceptual frameworks.

UNIT-V

Understanding how interfaces affect users- affective aspects, expressive interfaces, user frustration, agents. Process of interaction design- activities, characteristics, practical issues, Life cycle models. Design, Prototyping and Construction- prototyping, conceptual design, Physical design. Introducing evaluation- evaluation, frameworks. Testing and modeling users

Suggested Reading:

1. Wilbert O. Galitz , "The Essential Guide to User Interfce Design", Wiley Dreamtech, 2002.
2. Sharp, Rogers, Preece, "*Interaction Design*", 2nd Edition, John Wiley, 2008.
3. John M. Caroll , "*Human - Computer Interaction* – In the New Millennium", Pearson Education,2010

CS 464 UE With effect from the academic year 2014-2015

CLOUD COMPUTING
(ELECTIVE-IV)

Instruction	4 Periods per week
Duration of University Examination	3 Hours
University Examination	75 marks
Sessional	25 marks
Credits	4

Course Objectives:

- To provide introduction to need of current computing scenario
- To learn about mechanisms that enable cloud computing
- To study the architecture and standards of cloud computing
- To provide an introduction to programming and security features currently available.

Course Outcomes:

- Awareness about cloud enabling technologies such as virtualization and SOA.
- Ability to write programs in MPI and Map Reduce
- Ability to understand the security requirements of cloud
- Awareness of standards in cloud computing.

UNIT-I

Overview of Cloud Computing: Introduction to Cloud Computing, Need and Motivation of Cloud computing, System Models for Distributed and Cloud Computing, Roots of Cloud Computing, Grid and Cloud, Layers and Types of Clouds, Desired Features of a Cloud, Basic Principles of Cloud Computing, Challenges and Risks, Service Models.

UNIT-II

Virtualization: Introduction to virtualization, Virtual Machines and Virtualization of Clusters and Data Centers, Levels of Virtualization, Virtualization Structures / tools and Mechanisms, Virtualization of CPU, Memory and I/O Devices, Virtual Clusters and Resource Management, Virtualization Data-Center Automation.
Case Studies: Xen Virtual machine monitors – Xen API. VMware – VMware products – VMware features. Microsoft Virtual Server – Features of Microsoft Virtual Server.

UNIT-III

Cloud computing architectures over Virtualized Data Centers: Data–Center design and Interconnection networks, Architectural Design of Compute and Storage Clouds, Public Cloud Platforms, GAE, AWS, Azure, Inter-cloud Resource Management.

UNIT-IV

Cloud Security and Trust Management, data Security in the Cloud: An Introduction to the Idea of Data Security, The Current State of Data Security in the Cloud, **CryptDb**: Onion Encryption layers – DET, RND, OPE, JOIN, SEARCH, HOM and Homomorphic Encryption, FPE. Trust, Reputation and Security Management.

UNIT-V

Cloud Programming and Software Environments: Features of Cloud and Grid Platforms, parallel and distributed Programming Paradigms, Overview of Hadoop, MapReduce and MPI, Programming Support of

Google App Engine, Programming on Amazon AWs and Microsoft Azure, Emerging Cloud Software Environments.

Common Standards in Cloud Computing: The Open Cloud Consortium, the Distributed Management Task Force, Standards for Application Developers, Standards for Messaging. Internet Messaging Access Protocol (IMAP), Standards for Security, Examples of End-User Access to Cloud Computing.

Suggested Reading:

1. John W. Rittinghouse, James F. Ransome, "*Cloud Computing: Implementation, Management, and Security* ", CRC Press 2009.
2. Kai Hwang, Geoffrey C.Fox, Jack J.Dongarra, "*Distributed and Cloud Computing From Parallel Processing to the Internet of Things*", Elsevier, 2012.
3. Rajkumar Buyya, James Broberg and Andrzej M. Goscinski," *Cloud Computing: Principles and Paradigms (Wiley Series on Parallel and Distributed Computing)*, Wiley *Publishing* ©2011
4. Raluca Ada Popa, Catherine M.S.Redfield, Nickolai Zeldovich and Hari Balakrishnana, "*CryptDB:Protecting Confidentiality with encrypted Query Processing*" 23rd ACM Symposium on Operating Systems Principles (SOSP 2011), Cascais, Portugal October 2011.
5. A Fully Homomorphic Encryption Scheme, Craig Gentry September 2009.
6. David Marshall, Wade A. Reynolds, "*Advanced Server Virtualization*: VMware *and Microsoft Platform in the Virtual Data Center*", Auerbach Publications, 2006.

Web resources:

1. http://aws.amazon.com/
2. http://code.google.com/appsengine
3. http://www.buyya.com/

With effect from the academic year 2014-2015

BM 454 UE

BIOELECTRICITY

(Elective-III for CSE/ECE/EEE/ME)

Instruction:	4 Periods per week
Duration of University Examination:	3 Hours
University Examination	75 Marks
Sessional:	25 Marks
Credits	4

Course Objectives:

- Electrical properties of the cell membrane
- Action potentials
- Extra cellular waveforms
- Cardiac electrophysiology
- Function stimulation (FES)

UNIT I

Basic Electromagnetic theory: Scalar and Vector quantities. Gradient, Divergence, Laplacian Operators. Vector Identities, Guass theorem, Green`s theorem, Electrical sources and fields, Fundamental Relationships, Poisson`s Equation, Concept of monopole and dipole filed.

UNIT II

Action potentials and propagation: Membrane structure, Nernst Potential and Resting Potential Action Potential-Origin and Characteristics. Application of Nernst equation in bio fluids. Voltage clamp. Hodgkin-Huxley equations analysis. Core conductor model, Propagation in myelinated and unmyelinated nerve fibres.

UNIT III

Electrophysiology of skeletal muscle and neuromuscular junction: Release of Neuromuscular transmitter, post junctional response to transmitter. Origin of EPSP and IPSP. Neuro-muscular block, determination of degree of neuro-muscular block. Muscle structure and contraction. Excitation contraction mechanism.

.UNIT IV

Electro-physiology of Heart: Properties of Cardiac muscle, Heart vector, electrical activity of the heart. Standard leads, lead vectors. Recording of the ECG from the surface. Dipole theory of the heart. Relationship between the different ECG leads.

UNIT V

Application of Bio-Electric Phenomena:

Functional Neuro-muscular stimulation, impedance plethysmography, measurement of resistance of isotropic & anisotropic tissue and Electro encephalography.

Suggested Reading:

1. Plonsey Robert and Roger C., Barr R., *Bioelectricity*, Plenum Press, 1988.
2. Plonsey Robert and Flemng David G., *Bioelectricity Phenomena*, McGraw Hill, 1969.
3. D.P.Zipes and J.Jalife, *Cardiac Elecro-physiology*:*From Cell to Bedside*, Saunders, Philadelphia, 1990.

CE 461UE

With effect from the academic year 2014-2015

DISASTER MANAGEMENT
(Elective –IV for BME/CSE/CE/ECE/EE/ME)

Instruction	4	Periods per week
Duration of University Examination	3	Hours
University Examination	75	Marks
Sessionals	25	Marks

Course Objectives:

- To provide students an exposure to disasters, their significance and types.
- To ensure that students begin to understand the relationship between vulnerability, disasters, disaster prevention and risk reduction
- To gain a preliminary understanding of approaches of Disaster Risk Reduction (DRR)
- To enhance awareness of institutional processes in the country and
- To develop rudimentary ability to respond to their surroundings with potential disaster response in areas where they live,with due sensitivity

UNIT-I

Introduction to Disasters: Concepts and definitions of Disaster, Hazard, Vulnerability, Resilience, Risks. **Natural and Manmade disasters**, impact of drought, review of past disasters and drought in India, its classification and characteristics. Classification of drought, causes, Impacts (including social, economic. political, environmental, health, psychosocial, etc.

UNIT-II

Disaster: Classifications, Causes, Impacts including social, economic, political, environmental, health, psychosocial etc.

Differential impacts - in terms of caste, class, gender, age, location, disability Global trends in disasters, urban disasters, pandemics, complex emergencies, climate change.

Cyclones and Floods: Tropical cyclones & Local storms, Destruction by tropical cyclones and local storms, Cumulative atmospheric hazards/ disasters, Cold waves, Heat waves, Causes of floods, Rood hazards in India.

UNIT-III

Approaches to Disaster Risk Reduction: Disaster cycle - its analysis, Phases,Culture of safety, prevention, mitigation and preparedness community based DRR, Structural- nonstructural sources, roles and responsibilities of community, Panchayati Raj Institutions/Urban Local Bodies (PRis/ULBs), states, Centre, and other stake-holders.

UNIT-IV

Inter-relationship between Disasters and Development: Factors affecting Vulnerabilities, differential impacts, impact of development projects such as darns, embankments, changes in Land-use etc. Climate Change Adaptation, Relevance of indigenous knowledge, appropriate technology and local resources.

UNIT-V

Disaster Risk Management in India: Hazard and Vulnerability profile oflndia Components of Disaster Relief: Water, Food, Sanitation, Shelter, Health, Waste Management Institutional arrangements (Mitigation, Response and Preparedness, OM Act and Policy, other related policies, plans, programmes and legislation)

Field Work, Case Studies: The field work is meant for students to understand vulnerabilities and to work on reducing disaster risks and to build a culture of safety. Projects must be conceived creatively based on the geographic location and hazard profile of the region where the college is located.

Suggested Reading:

1. 1. Sharma V. K. (1999). Disaster Management, National Centre for Disaster Management, IIPE, Delhi.
2. Gupta Anil K, and Sreeja S. Nair. (2011). Environmental Knowledge for Disaster Risk Management, NIDM, New Delhi.
3. Nick. (1991). Disaster Management: A Disaster Manager's Handbook. Asian Development Bank, Manila Philippines.
4. Kapur, et al. (2005). Disasters in india Studies of grim reality, Rawat Publishers, Jaipur.
5. Pelling Mark, (2003). The Vulnerability of Cities: Natural Disaster and Social Resilience Earthscan publishers, London.

ME 460 UE With effect from the academic year 2014-2015

ROBOTICS
(Elective –IV)

Instructions	4 periods per week
Duration of University Examination	3 Hours
University Examination	75 Marks
Sessional	25 Marks
Credits	4

UNIT-I

Introduction to Robotics Basic structure of Robots. Degree of freedom of Robots. Work envelope. Classification of Robots based on drive Technology, Work-Envelope and motion control methods. Application of Robots in Industry. Specification of requirement of motion and force for different application. Repeatability, Precision and Accuracy as applied to Robots.

UNIT-II

Rotation matrix. Homogeneous transformation matrix. Denavit and Hartenberg representation. Euler angles and RPY representation. Representation of absolute position and orientation in terms of joint parameters, Kinematic equation for manipulators. Inverse kinematics of Robot arm for position and orientation. Redundancy in Robots.

UNIT-III

Jacobian for direct and inverse kinematics. Trajectory planning for Robots. Trajectory control based on incremental inverse kinematics of kinematic equations, Static force analysis, stiffness.

UNIT-IV

Newton - Euler formulation of dynamic equation. Lagrangian formulation. Inertia tensor. Control schemes, individual joint control and disadvantages. Control through computed torques.

UNTT-V

Position and velocity measurement. Optical encoders. Different types of End effectors for industrial Robots. Range and Proximity sensing. Tactile sensors. Force and Torque sensors. Drives used in industrial Robots. Introduction to techniques used in Robot vision. Image acquisition and processing. Introduction to Robot programming.

Suggested Reading

1. Fu. K.S., Gon Zalez R.C., Lee C.S.G. "*Robotics, Control-sensing vision and Intelligence*", McGraw Hill, Int. Ed., 1987.
2. Asada and Slotine, "*Robot Analysis and Intelligence*", Willey-Inter-Science, 1986.
3. Spong and Vidyasagar, "*Robot Dynamics & Control*", John Wiley and Sons, Ed., 1990.
4. Groover M P, "*Industrial Robotics*", McGraw Hill Publications, 1999.
5. Mittal and Nagrath, "*Industrial Robotics*", Tata McGraw Hill Publications, 2004.

LA 454 UE With effect from Academic Year 2014-2015

INTELLECTUAL PROPERTY RIGHTS
(Elective –IV for BME/CSE/CE/ECE/EE/ME)

Instruction	4 Periods per week
Duration of University Examination	3 Hours
University Examination	75 Marks
Sessional	25 Marks
Credits	4

UNIT I
Meaning of Intellectual Property Rights. Justification of Intellectual Property Rights. Classification of these rights. Classification of treaties relating to Intellectual Property Rights – i) Standard setting treaties ii) Global protection system treaties iii) Classification treaties.
The salient features of the TRIPS Agreement. The two international institution – i) The World intellectual property organization ii) The world trade organization.

UNIT II
History of the patent system, Patents in all fields of technology.

i. Patents on genetic resources patents on chemicals, design, patents based on software, business methods, internet patterns, etc.
ii. Exceptions to exclusive rights conferred to a patent holder
iii. Grounds for revocation of a patent.
iv. Remedies for infringement of patent.

UNIT III
Copyrights and related rights. Nature and scope of protection of copyrights and related rights. Protection of copyrights in the digital media, Defence of fair use. Moral rights of the author. Copyrights societies. Remedies for infringement of copyrights.

UNIT IV
Nature and scope of protection of design rights. Protection of layout designs (topographies) of Integrated circuits, Protection of undisclosed information, Protection of trade marks, domain names and geographical indications.

UNIT V
Practical aspects – drafting of a patent. Some exercises on the preliminary rules of preparing an application seeking a patent.

Suggested Reading:

1. Cornish WR. *Intellectual Property: Patents, Copyright, Trademarks and Allied Rights*, Sweet and Maxwell, 1993.
2. P.Narayana, *Intellectual Property Law, Eastern law House*, 2nd Edition, 1997.
3. Robin Jacob, Daniel Alexander. *A Guide Book to Intellectual Property Patents Trademarks, Copyrights and Design,* Sweet and Maxwell, 4th Edition, 1993.

SERVICE COURSES OFFERED TO OTHER DEPARTMENTS

CS 459 UE With effect from the academic year 2014-2015

INFORMATION SECURITY
(ELECTIVE III for BME/CE/ECE/EE/ME**)**

Instruction	4 Periods per week
Duration of University Examination	3 Hours
University Examination	75 Marks
Sessionals	25 Marks

Course Objectives:

- To learn legal and technical issues in building secure information systems
- To provide an understanding of network security
- To expose the students to security standards and practices

UNIT-I

Introduction: Characteristics of Information, Components of Information Systems, Securing components, balancing Security and Access The Security System Development Life Cycle, Security Professionals and the organization. Security Investigation Phase; Need for security, Threats, Attacks.

UNIT-II

Legal, Ethical, and Professional Issues in Information Security Ethical Component in Information System, Codes of Ethics, Certification Security Analysis: Risk Management, Identifying and assessing risk, and Controlling Risk.

UNIT-III

Logical Design: Blue print for security. Security Policy, standards and Practices, Design of Security Architecture.

Physical Design: Security Technology, Physical Design of Security SDLC Firewalls, Dialup Protection, Intrusion Detection Systems, Scanning and analysis tools, and Content filters.

UNIT-IV

Cryptography: The basic elements of cryptography: symmetric (Symmetric Key-DES, IDEA, and AES), and public key cryptography (Public Key Encryptions-RSA).

UNIT-V

Message digest (MD-5, SHA), and digital signatures.

SSL and SET: SSL and SET protocols, Internet transactions using both SSL and SET.

Suggested Reading:

1. Michael E. Whitman and Herbert J. Mattord, "*Principles of Information Security*", Thomson, 2003.
2. William Stallings, "*Cryptography and Network Security*", Pearson Education, 2000.
3. Nina Godbole, "*Information System Security*", John Wiley & Sons, 2008.