Fourth Year - Seventh Semester

Branch: Computer Science and Engineering

Course Code	**CS 701**
Course Title	**DIGITAL IMAGE PROCESSING**
Type of Course	Core
L T P	3 1 0
Credits	4
Course Assessment Methods End Semester Assessment (University Exam.) Continuous Assessment (Sessional, Assignments, Quiz)	 50 50
Course Prerequisites	Computer Graphics (CS 502)
Course Objectives (CO)	1. To introduce the various image processing techniques and their applications in different domains. To get students acquainted with computer vision.
Course Outcome	1. Understand the basic terms related to imaging, types of images, image conversions, matrix calculations, steps involved in image processing, its need in real time applications, state of art, color models and color image processing, various domains. 2. Understand and develop various image enhancement filters both in spatial and frequency domain, restoration process after discussing degradation functions, role of image enhancement and restoration in any image processing application. The implementation of same is also required to be done practically. 3. Discuss the role and need of image compression and its techniques, morphological operations, role and need of segmentation, types of segmentation, edge segmentation, various segmentation algorithms like region growing, region splitting and merging, watershed etc., calculations and practice of numerical related to segmentation. 4. Discuss various boundary and regional descriptor methods, equation related to boundary detection, various types of image features and methods defined for object recognition.

SYLLABUS

Note for Examiner- *Examiner will set 7 questions of equal marks. First question will cover whole syllabus, having 10 conceptual questions of 1 mark each or 5 questions of 2 mark each and is*

compulsory. Rest of the paper will be divided into two parts having three questions each and the candidate is required to attempt at least two questions from each part.

SECTION-A

Introduction to Image Processing:

Digital Image representation, Sampling & Quantization, Steps in image Processing, Image acquisition, color image representation

(6 hours)

Image Transformation & Filtering:

Intensity transform functions, histogram processing, Spatial filtering, fourier transforms and its properties, frequency domain filters, , color models, Pseudo coloring, color transforms, Basics of Wavelet Transforms.

(12 hours)

Image Restoration:

Image degradation and restoration process, Noise Models, Noise Filters, degradation function, Inverse Filtering, Homomorphism Filtering

(7 hours)

SECTION-B

Image Compression:

Coding redundancy, Interpixel redundancy, Psychovisual redundancy, Huffman Coding, Arithmetic coding, Lossy compression techniques, JPEG Compression.

(8 hours)

Image Segmentation & Representation:

Point, Line and Edge Detection, Thresholding, Edge and Boundary linking, Hough transforms, region Based Segmentation, Boundary representation,Boundary Descriptors, Regional Descriptors.

(12 hours)

TEXT BOOKS			
S. No.	**NAME**	**AUTHOR(S)**	**PUBLISHER**
1	Digital Image Processing	Gonzalez and Woods	Addison Wesley, 1992
2	Computer Vision	Boyle and Thomas	2nd edition, Blackwell Science, 1995
3	Digital Image Processing and Pattern Recogination	Pakhira Malay K	PHI

Branch: Computer Science and Engineering

Course Code	**CS 751**
Course Title	**DIGITAL IMAGE PROCESSING (Practical)**
Type of Course	Core
L T P	0 0 3
Credits	1
Course Assessment Methods End Semester Assessment Continuous Assessment	 50

SYLLABUS

Practical should be covered based on the following directions:

1. Reading and displaying images in different formats using different color models.
2. Converting color images into monochrome images, Image color enhancements using pseudo coloring techniques.
3. Images enhancements using grey level transformations and spatial and frequency domain filters
4. Image Noise removal and inverse filtering of images
5. Point, Line, Edge and Boundary Detections in images
6. Histogram Matching and specification on images
7. Boundary Linking, Representation and Description techniques on images
8. Thresholding & Magnification of Images
9. Image Morphological Operations
10. Object Recognition Techniques

Branch: Computer Science and Engineering

Course Code	**CS 702**
Course Title	**ADVANCE DATABASE SYSTEMS**
Type of Course	Core
L T P	3 1 0
Credits	4
Course Assessment Methods End Semester Assessment (University Exam.) Continuous Assessment (Sessional, Assignments, Quiz)	 50 50
Course Prerequisites	Database Systems (CS 302)
Course Objectives (CO)	1. To review various Database concepts, Data models and their architectures. 2. To introduce Advanced Strategies for implementation of Transaction processing, concurrency control and Recovery management. 3. To learn how to optimize query processing. 4. To familiarize with concepts of Distributed databases and their implementation concepts. 5. To elaborate Significance of Data warehouses and their setup strategies. 6. To understand role of Data mining, OLAP, OLTP in databases and their implementation strategies. 7. To familiarize with Object oriented databases and their significance. 8. To expose to various databases like oracle, Sql server, DB2, MySqletc through case studies.
Course Outcome	1. Recall various Database concepts with discovery of advanced strategies for Transaction processing, Concurrency control, Recovery management and Query Processing. 2. Understand Object Oriented and Distributed databases. 3. Learn significance of Data warehousing, Data mining, OLAP and OLTP. 4. Examine various Case studies: Oracle, Sql server, DB2, MySql etc.

SYLLABUS

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SECTION-A

Introduction to Database Systems:
Database System Concepts and Architecture, Data Models, Data Independence, SQL: DDL, DML, DCL, Normalization: 1NF, 2NF, 3NF, BCNF, 4NF, 5NF.
(6 hours)

Query Processing and Optimization:
Query Processing, Syntax Analyzer, Query Decomposition, Query Optimization, Heuristic Query Optimization, Cost Estimation, Cost Functions for Select, Join, Query Evaluation Plans.
(6 hours)

Transaction Processing and Concurrency Control:
Transaction Processing Concepts, Concurrency Control Techniques: Two-phase Locking, Timestamp Ordering, Multiversion, Validation, Multiple Granularity Locking.
(5 hours)

Object Oriented and Object Relational Databases:
Object Oriented Concepts, Object Oriented Data Model, Object Definition Language, Object Query Language, Object Relational Systems, SQL3, ORDBMS Design.
(5 hours)

SECTION-B

Distributed Databases:
Distributed Database Concepts, Advantages and Disadvantages, Types of Distributed Database Systems, Data Fragmentation, Replication and Allocation Techniques for Distributed Database Design, Five Level Schema Architecture, Query Processing, Concurrency Control and Recovery in Distributed Databases.
(6 hours)

Backup and Recovery:
Types of Database Failures, Types of Database Recovery, Recovery Techniques: Deferred Update, Immediate Update, Shadow Paging, Checkpoints, Buffer Management.
(5 hours)

Introduction to Data Warehousing and Data Mining:
Introduction to OLAP, OLTP, Data Warehouse, Data Marts, Data Mining, Data Mining Process.
(5 hours)

Commercial Databases:
Commercial Database Products, Familiarity with IBM DB2 Universal Database, Oracle, Microsoft SQL Server, MySql, their features.
(7 hours)

TEXT BOOKS			
S. No.	**NAME**	**AUTHOR(S)**	**PUBLISHER**
1	Fundamentals of Database Systems	RamezElmasri, ShamkantNavathe	5th edition, Pearson Education, 2007
2	Database Management Systems,	Raghu Ramakrishnan, Johannes Gehrke	Tata McGraw-Hill
3	An Introduction to Database Systems	C.J. Date	8th edition, Pearson Education
4	Database Management Systems	Alexis Leon, Mathews Leon	Leon Press
5	Database System Concepts	Abraham Silberschatz, Henry F. Korth, S. Sudarshan	Tata McGraw-Hill
6	Database Systems Concepts, Design and Applications	S. K. Singh	Pearson Education

Branch: Computer Science and Engineering

Course Code	**CS 703**
Course Title	**CYBER LAWS AND IPR**
Type of Course	Core
L T P	3 1 0
Credits	4
Course Assessment Methods End Semester Assessment (University Exam.) Continuous Assessment (Sessional, Assignments, Quiz)	 50 50
Course Prerequisites	None
Course Objectives (CO)	1. To introduce the Cyber laws and Intellectual property rights.
Course Outcome	1. To understand the various cyber laws those govern the cyber space. 2. To understand the legal aspects of e-commerce. 3. To understand the Intellectual Property Rights and the different components of the IT Act.

SYLLABUS

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SECTION-A

Basics of Computer & Internet Technology

Internet, ISP & domain name; Network Security; Encryption Techniques and Algorithms; Digital Signatures.

(8 hours)

Introduction to Cyber World

Introduction to Cyberspace and Cyber Law; Different Components of cyber Laws; Cyber Law and Netizens.

(2 hours)

E-Commerce

Introduction to E-Commerce; Different E-Commerce Models; E-Commerce Trends and Prospects; E-Commerce and Taxation; Legal Aspects of E-Commerce.

(7 hours)

SECTION-B

Intellectual Property Rights

IPR Regime in the Digital Society; Copyright and Patents; International Treaties and Conventions; Business Software Patents; Domain Name Disputes and Resolution.

(12 hours)

IT Act, 2000

Aims and Objectives; Overview of the Act; Jurisdiction; Role of Certifying Authority; Regulators under IT Act; Cyber Crimes-Offences and Contraventions; Grey Areas of IT Act.

(12 hours)

Project Work

Candidates will be required to work on a project. At the end of the course students will make a presentation and submit the project report.

(4 hours)

TEXT BOOKS			
S. No.	**NAME**	**AUTHOR(S)**	**PUBLISHER**
1	A Guide to Cyber Laws & IT Act 2000 with Rules & Notification	NandanKamath	Galgotia Publications
2	Cyber Cops, Cyber Criminals& Internet	Keith Merill& Deepti Chopra	(IK Inter.)
3	Information Technology Laws	Diane Row Land	TATA McGraw Hill
4	Handbook of Cyber Law	Vakul Sharma	(McMillian)

Branch: Computer Science and Engineering

Course Code	**CS 704A**
Course Title	**SOFTWARE PROJECT MANAGEMENT**
Type of Course	Elective
L T P	3 1 0
Credits	4
Course Assessment Methods End Semester Assessment (University Exam.) Continuous Assessment (Sessional, Assignments, Quiz)	 50 50
Course Prerequisites	Software Engineering (CS 404), Software Testing and Quality Assurance (CS 605A)
Course Objectives (CO)	1. To introduce the concepts of software project management. 2. To make them understand the role and importance of project planning, estimation and scheduling activities and the relevant techniques. 3. To make them understand the role and usage of project and process metrics. 4. To make them aware about risk management, maintenance and reengineering issues.
Course Outcome	1. Understand project management activities like planning, estimation and scheduling. 2. Use techniques and tools relevant to planning, estimation and scheduling. 3. Identify quality requirements, security risks and the approaches to address them. 4. Apply risk management, configuration management, quality management, maintenance and reengineering concepts.

SYLLABUS

Note for Examiner- *Examiner will set 7 questions of equal marks. First question will cover whole syllabus, having 10 conceptual questions of 1 mark each or 5 questions of 2 mark each and is compulsory. Rest of the paper will be divided into two parts having three questions each and the candidate is required to attempt at least two questions from each part.*

SECTION-A

Project Management Concepts

The management spectrum, the people, the product, the process, the project, stakeholders, W^5HH Principle, critical practices, the SPM plan, project planning steps.

(4 hours)

Process and Project Metrics

Metrics in the Process and Project Domains, Software Measurement, Size-Oriented Metrics, Function-Oriented Metrics, Reconciling LOC and FP Metrics, Object-Oriented Metrics, Use Case-Oriented Metrics, WebApp Project Metrics, Metrics for Software Quality, Integrating Metrics within the Software Process, Establishing a Software Metrics Program.

(6 hours)

Estimation for Software Projects

The Project Planning Process, Selection of an appropriate project approach, Software Project Estimation, Decomposition Techniques, Software Sizing, Problem-Based Estimation, An Example of LOC-Based Estimation, An Example of FP-Based Estimation, Process-Based Estimation, Estimation with Use Cases, Reconciling Estimates, Empirical Estimation Models, Estimation for Object-Oriented Projects, Specialized Estimation Techniques, The Make/Buy Decision.

(7 hours)

Project Scheduling

Basic Concepts of Project Scheduling, The Relationship between People and Effort, Effort Distribution, Defining a Task Set for the Software Project, Refinement of Major Tasks, Time-Line Charts, Tracking the Schedule, Tracking Progress for an OO Project, Scheduling for WebApp and Mobile Projects, Earned Value Analysis, Project Monitoring and Control.

(6 hours)

SECTION-B

Quality Planning

Quality Concepts, Quality control, Quality assurance, Formal Technical Reviews, Team Management, The SQA Plan, ISO and CMM standards.

(7 hours)

Risk Management

Reactive versus Proactive Risk Strategies, Software Risks, Risk Identification, Assessing Overall Project Risk, Risk Projection, Assessing Risk Impact, Risk Refinement, Risk Mitigation, Monitoring, and Management, The RMMM Plan.

(4 hours)

Configuration Management

Elements of a Configuration Management System, Baselines, Software Configuration Items, Management of Dependencies and Changes, The SCM Repository, The SCM Process, Version Control, Change Control, Configuration Audit, Status Reporting, Configuration Management for Web and MobileApps.

(4 hours)

Maintenance and Reengineering

Software Maintenance, Software Supportability, Reengineering, Business Process Reengineering, Software Reengineering Process Model, Reverse Engineering, Restructuring, Forward Engineering, The Economics of Reengineering.

(7 hours)

TEXT BOOKS			
S. No.	**NAME**	**AUTHOR(S)**	**PUBLISHER**
1	Software Project Management	Bob Hughes and Mike Cotterell	Latest edition, McGraw Hill
2	Software Engineering	Roger S. Pressman, Bruce R. Maxim	8th edition, McGraw Hill
3	Software Project Management in Practice	Pankaj Jalote	Latest edition, Addison Wesley
4	Software Project Management	Walker Royce	Latest edition, Addison Wesley
5	Software Project Management: A Concise Study	S A Kelkar	Latest edition, PHI
6	Software Project Management: A Real-World Guide To Success	Joel Henry	Latest edition, Pearson

Branch: Computer Science and Engineering

Course Code	**CS 754A**
Course Title	**SOFTWARE PROJECT MANAGEMENT (Practical)**
Type of Course	Elective
L T P	0 0 3
Credits	1
Course Assessment Methods End Semester Assessment Continuous Assessment	 50

SYLLABUS

Practical based on Software Project Management syllabus.

Branch: Computer Science and Engineering

Course Code	**CS 704B**
Course Title	**NATURAL LANGUAGE PROCESSING**
Type of Course	Elective
L T P	3 1 0
Credits	4
Course Assessment Methods End Semester Assessment (University Exam.) Continuous Assessment (Sessional, Assignments, Quiz)	 50 50
Course Prerequisites	Principle of Programming Languages (CS 504), Theory of Computation (CS 505)
Course Objectives (CO)	1. This course is designed to introduce students to the fundamental concepts and ideas in natural language processing (NLP), and to get them up to speed with current research in the area.
Course Outcome	1. Gain understanding of linguistic phenomena and will explore the linguistic features relevant to each NLP task. 2. Develop understanding in syntactic and semantic processing of text. 3. Be familiar with different NLP Concepts and Resources for doing research in NLP.

SYLLABUS

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SECTION-A

Introduction to NLP:
Introduction and Survey of applications, Levels of linguistic processing: morphology, syntax, semantics, Tokenization, Stemming, N-grams Modeling
(4 hours)

Language processors and Understanding: recognizers, transducers, parsers, generators, Language as a rule-based system, Language understanding as an inferential activity.

(10 hours)

Resources for NLP:
Introduction to lexicons and knowledge bases.

(2 hours)

Computational morphology
lemmatization, Part-of-Speech Tagging, Finite-State Analysis, noun phrase chunking.

(5 hours)

SECTION-B

Syntactic Processing:

Basic parsing: Top Down and Bottom Up parsing, Chart parsing, Deterministic parsing, Statistical parsing, Grammars with features, Unification Grammars, The Lexicon

(6 hours)

Semantic Interpretation:

Lexical semantics, Semantics and logical form, Resolving ambiguities: Word Sense Disambiguation, Linking syntax and semantics, Linking syntax and semantics in restricted domains

(6 hours)

Context and World Knowledge:

Discourse: linguistic context, Ellipsis; World knowledge, Discourse structure Conversation and co-operation, Implementing "co-operative responses", Information Retrieval and Information Extraction.

(6 hours)

NLP concepts: named entity recognition, coreference resolution, question answering, text classification, document clustering, text summarization, machine translation, Basics of Machine Learning.

(6 hours)

TEXT BOOKS			
S. No.	**NAME**	**AUTHOR(S)**	**PUBLISHER**
1	Natural language understanding	Allen, J	2nd Edition, Redwood City, CA: 1994. Benjamin/Cummings
2	Natural Language Processing for Prolog. Programmers	Covington, M.A	Prentice Hall, 1994
3	Speech and Language Processing	Jurafsky, D. and Martin	Prentice Hall, 2000
4	Natural Language Processing in Prolog: An Introduction to Computational Linguistics	Gazdar, G. &Mellish, C.	Addison Wesley, 1989

Branch: Computer Science and Engineering

Course Code	**CS 754B**
Course Title	**NATURAL LANGUAGE PROCESSING (Practical)**
Type of Course	Elective
L T P	0 0 3
Credits	1
Course Assessment Methods End Semester Assessment Continuous Assessment	 50

SYLLABUS

Practical based on Natural Language Processing syllabus.

Branch: Computer Science and Engineering

Course Code	**CS 704C**
Course Title	**BUSINESS INTELLIGENCE**
Type of Course	Elective
L T P	3 1 0
Credits	4
Course Assessment Methods End Semester Assessment (University Exam.) Continuous Assessment (Sessional, Assignments, Quiz)	 50 50
Course Prerequisites	Database Systems (CS 302)
Course Objectives (CO)	1. To introduce the concepts of Business process their requirements, key performance indicators and their evaluation in a typical Business houses. 2. To introduces the concept of data warehouses and use of multi dimensional databases and Online Analytical processing. 3. To introduce the basic data mining concepts like Association Rule Analysis, classification, clustering and their use in different application domains.
Course Outcome	1. Understand fundamental Business processes, their requirements, evaluation using key performance indicators, 2. Demonstrate an understanding of BI framework and its implementation using open source tools. 3. Demonstrate an understanding of various concepts related to data warehousing and OLAP. 4. Use different data mining representation techniques used in different domains.

SYLLABUS

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SECTION-A

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
(8 hours)

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, Introduction to data quality, data profiling concepts and applications.

(8 hours)

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

(8 hours)

SECTION-B

Basics of Enterprise Reporting
Introduction to enterprise reporting, concepts of dashboards, balanced scorecards, and overall architecture

(6 hours)

Data Mining Functionalities:
Association rules mining, Mining Association rules from single level, multilevel transaction databases, Classification and prediction, Decision tree induction, Bayesian classification, k-nearest neighbor classification, Cluster analysis, Types of data in clustering, categorization of clustering methods

(15 hours)

TEXT BOOKS			
S. No.	**NAME**	**AUTHOR(S)**	**PUBLISHER**
1	Fundamentals of Business Analytics	R N Prasad, Seema Acharya	1st edition, Wiley India, 2011
2	Data Mining: Concepts and Techniques	Han and M. Kamber	Latest edition, Morgan Kaufman publishers, Harcourt India pvt. Ltd, 2010
3	Business Intelligence: The Savvy Manager's Guide.	David Loshin	Latest edition, Knowledge Enterprise, 2011
4	Business Intelligence roadmap	Larissa Terpeluk Moss, ShakuAtre	Latest edition, Addison Wesley, 2012
5	Successful Business Intelligence: Secrets to making Killer BI Applications	CindiHowson	Latest edition, Tata McGraw Hill, 2012
6	Business intelligence for the enterprise	Mike Biere	Latest edition, Addison Wesley, 2010

Course Code	**CS 754C**
Course Title	**BUSINESS INTELLIGENCE (Practical)**
Type of Course	Elective
L T P	0 0 3
Credits	1
Course Assessment Methods End Semester Assessment Continuous Assessment	 50

SYLLABUS

Practical based on Business Intelligence syllabus.

Branch: Computer Science and Engineering

Course Code	**CS 704D**
Course Title	**WIRELESS SENSOR NETWORKS**
Type of Course	Elective
L T P	3 1 0
Credits	4
Course Assessment Methods End Semester Assessment (University Exam.) Continuous Assessment (Sessional, Assignments, Quiz)	 50 50
Course Prerequisites	Data Communication and Networks (CS 501)
Course Objectives (CO)	1. Understand the design issues in Adhoc and Wireless Sensor networks (WSN) 2. Learn architecture and deployment features of WSN 3. Be familiar with different types of routing protocols 4. Knowledge of different sensors and Software platform
Course Outcome	1. Understand the concepts, network architectures and applications of Adhoc and Wireless Sensor Networks 2. Analyze the protocol design issues of Adhoc and Sensor networks 3. Implement routing protocols for Adhoc and Wireless Sensor Networks with respect to some protocol design issues 4. Evaluate the QoS related performance measurements of Adhoc and Sensor networks and understanding of different kinds and types of sensor for deployment

SYLLABUS

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SECTION-A

Introduction

Fundamentals of Wireless Communication Technology – The Electromagnetic Spectrum, Radio propagation Mechanisms, Characteristics of the Wireless Channel, Mobile Adhoc Networks (MANETs) and Wireless Sensor Networks (WSNs):concepts and architectures. Applications of AdHoc and Sensor networks. Design Challenges in Adhoc and Sensor Networks.
(8 hours)

Overview of Wireless Sensor Networks and its Architecture

Challenges for Wireless Sensor Networks, Enabling Technologies For Wireless Sensor Networks. Single-Node Architecture - Hardware Components, Energy Consumption of Sensor Nodes , Operating Systems and Execution Environments, Network Architecture - Sensor Network Scenarios, Optimization Goals and Figures of Merit, Gateway

Concepts

(9 hours)

Networking Sensors

Physical Layer and Transceiver Design Considerations, MAC Protocols for Wireless Sensor Networks, Low Duty Cycle Protocols And Wakeup Concepts - S-MAC , The Mediation Device Protocol, Wakeup Radio Concepts, Address and Name Management, Assignment of MAC Addresses

(9 hours)

SECTION-B

WSN Routing, Localization and QOS

Issues in WSN routing – OLSR- Localization – Indoor and Sensor Network Localization-absolute and relative localization, triangulation, Topology Control , Clustering, Time Synchronization, Localization and Positioning, Sensor Tasking and Control, QOS in WSN-Energy Efficient Design-Synchronization-Transport Layer issues.

(10 hours)

Sensor Network Platforms and Tools

Sensor Node Hardware – Berkeley Motes, Programming Challenges, Node-level software platforms, Node-level Simulators, State-centric programming.

(9 hours)

TEXT BOOKS			
S. No.	**NAME**	**AUTHOR(S)**	**PUBLISHER**
1	AdHoc Wireless Networks: architectures and Protocols	C. Siva Ram Murthy, and B. S. Manoj	6th edition, Prentice Hall Professional Technical Reference, 2008
2	Protocols and Architectures for Wireless Sensor Networks	Holger Karl and Andreas Willig	Wiley, 2005
RECOMMENDED BOOKS			
1	Ad Hoc & Sensor Networks: Theory and Applications	Carlos De MoraisCordeiro, Dharma Prakash Agrawal	World Scientific Publishing Company, 2006
2	Wireless Sensor Networks: - An Information Processing Approach	Feng Zhao and LeonidesGuibas	Elsevier Publication, 2007
3	Wireless Sensor Networks-Technology, Protocols, and Applications	KazemSohraby, Daniel Minoli, &TaiebZnati	John Wiley, 2007
4	Wireless Sensor Network Designs	.Anna Hac	John Wiley, 2003

Branch: Computer Science and Engineering

Course Code	**CS 754D**
Course Title	**WIRELESS SENSOR NETWORKS (Practical)**
Type of Course	Elective
L T P	0 0 3
Credits	1
Course Assessment Methods End Semester Assessment Continuous Assessment	 50

SYLLABUS

Practical based on Wireless Sensor Networks syllabus.

Branch: Computer Science and Engineering

Course Code	**CS 704E**
Course Title	**SENSOR SYSTEMS AND APPLICATIONS**
Type of Course	Elective
L T P	3 1 0
Credits	4
Course Assessment Methods End Semester Assessment (University Exam.) Continuous Assessment (Sessional, Assignments, Quiz)	 50 50
Course Prerequisites	None
Course Objectives (CO)	1. Develop judgment of what sensors and modalities are appropriate for different applications 2. Know how to electronically condition the sensor, hook it up to a microcomputer, and process the signal (at least basically) 3. Have some idea of how/where these sensors were used before 4. Have a reasonable idea of how different sensors work
Course Outcome	1. Understand fundamental of different types of sensors, 2. Demonstrate the use of different types of sensors available. 3. Able to capture data from multiple sensors and analyze it. 4. Design a simple application based on single sensor

SYLLABUS

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SECTION-A

Basics Sensors: Examples and Definitions, Introduction to Sensor Electronics and terminology (Fraden Ch. 2) Sensors classifications from output point of view and quasi-digital sensors classification; Sensors architectures for integrated and smart sensors; Informative parameters (unified and frequency-time domain parameters of signal); Advantages of frequency as informative parameter including high noise immunity, high power of signal, wide dynamic range, high reference accuracy, simple interfacing, simple Integration and coding.
(12 hours)

Mobile Phone Sensors

Capacitive sensors: Fundamentals, Applications and Examples (Fraden Ch. 3.2, 6.3, 7.3, 10.6), Accelerometers (Fraden Ch. 8)
Piezoelectric Sensors (Fraden Ch. 3.6, 5.2.4, 8.4)
Pressure sensors: Principles and Examples (Fraden Ch. 10)

Inductive and Magnetic Sensors (Fraden Ch. 3.3, 3.4, 7.4)

(9 hours)

SECTION-B

Application Sensors

Strain Gauges: Basics and Examples (FradenCh 3.5, 5.1, 5.2, 5.7, 9) ,Thermometers: Measurement Techniques and Examples, Flow Sensors (Fraden Ch. 16),Radiation Sensors: Overview of Types, Examples of Applications (Fraden Ch. 14)IR Sensors and Demo: IR Motion Active sounding: Methods for measurement, Examples

Chemical Sensors,Biosensors, RF sensors

(12 hours)

Data Acquisition Methods for Sensor Systems: Data acquisition (DAQ) systems, data-loggers, DAQ boards. Frequency-to-digital converter (FDC) - to - microcontroller interface.Different DAQ architectures and main errors of DAQ.

(12 hours)

TEXT BOOKS			
S. No.	**NAME**	**AUTHOR(S)**	**PUBLISHER**
1	Handbook of Modern Sensors: Physics, Designs, and Applications.	Fraden, J.	4th edition, Springer, India, 2010
2	Understanding the Smart Sensors	Frank. R,	2nd edition, ArtechHouse, 2010
3	Smart Sensor Systems by 2008	Meijer.M. C.G	Latest edition, John Willey & Sons Ltd, 2008

Branch: Computer Science and Engineering

Course Code	**CS 754E**
Course Title	**SENSOR SYSTEMS AND APPLICATIONS (Practical)**
Type of Course	Elective
L T P	0 0 3
Credits	1
Course Assessment Methods End Semester Assessment Continuous Assessment	 50

SYLLABUS

Practical based on Sensor Systems And Applications syllabus.

Branch: Computer Science and Engineering

Course Code	**CS 705A**
Course Title	**AGILE SOFTWARE DEVELOPMENT**
Type of Course	Elective
L T P	3 1 0
Credits	4
Course Assessment Methods End Semester Assessment (University Exam.) Continuous Assessment (Sessional, Assignments, Quiz)	 50 50
Course Prerequisites	Software Engineering (CS 404), Software Testing and Quality Assurance (CS 605A)
Course Objectives (CO)	1. To introduce the concepts of agile software development. 2. To make them understand agile process models and design practices. 3. To make them understand and apply agile testing concepts and principles. 4. To make them aware about agile project management and quality assurance related issues.
Course Outcome	1. Understand the principles and practices of agile software development. 2. Understand and apply agile design principles. 3. Understand and apply agile testing techniques. 4. Understand and conduct agile project management tasks like scheduling, estimation, monitoring and quality assurance activities.

SYLLABUS

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SECTION-A

Basics of Agile Software Development

The Genesis of Agile, Introduction and background, Agile Manifesto and Principles, Differences between Agile and traditional plans, Stakeholders, Challenges.

(6 hours)

Agile Approaches

Extreme Programming, Agile Process Models: Scrum, Project Phases, Dynamic Systems Development Method, Agile Modeling, Agile Unified Process. A Tool Set for the Agile Process, Feature Driven development, Lean Software Development, Agile Project management, Test Driven Development, Continuous Integration, Refactoring, Pair Programming.

(8 hours)

Agile Design

Agile Design practices, The Single-Responsibility Principle, The Open-Closed Principle, The Liskov-Substitution Principle, The Dependency-Inversion Principle, The Interface-Segregation Principle

(9 hours)

SECTION-B

Agile Testing

Planning and Managing Testing Cycle, Agile Lifecycle and its impact on testing, Principles of Agile Testing, Agile Testing Techniques, xUnit Framework, Test-Driven Development, User Acceptance Tests, Test Automation

(8 hours)

Agile Project Management

Scheduling in an agile project, scheduling challenges, estimating costs, monitoring project progress, burning down the product backlog, reporting, controlling the project

(7 hours)

Incorporating ISO 9001 into the Agile Transition

Quality Assurance in Agile World, Managing Scrum Teams, Agile Metrics, Incorporating ISO 9001 into the Agile Transition, Creating Policy and Process Documentation, Development processes, Focusing on customers, Resource management, Formal reviews.

(7 hours)

TEXT BOOKS			
S. No.	**NAME**	**AUTHOR(S)**	**PUBLISHER**
1	Agile Software Development, Principles, Patterns, and Practices	Robert C. Martin	Latest edition, Pearson
2	Enterprise-Scale Agile Software Development	James Schiel	Latest edition, CRC Press
3	Software Engineering	Roger S. Pressman, Bruce R. Maxim	8th edition, McGraw Hill
4	Agile software development Methods - Review and analysis	PekkaAbrahamsson, OutiSalo, JussiRonkainen&JuhaniWarsta	VTT Publications
5	Agile Testing	Lisa Crispin, Janet Gregory	Latest edition, Addison-Wesley
6	Succeeding with Agile: Software Development Using Scrum	Mike Cohn	Latest edition, Addison-Wesley

Branch: Computer Science and Engineering

Course Code	**CS 755A**
Course Title	**AGILE SOFTWARE DEVELOPMENT (Practical)**
Type of Course	Elective
L T P	0 0 3
Credits	1
Course Assessment Methods End Semester Assessment Continuous Assessment	 50

SYLLABUS

Practical based on Agile Software Development syllabus.

Branch: Computer Science and Engineering

Course Code	**CS 705B**
Course Title	**NEURAL NETWORKS**
Type of Course	Elective
L T P	3 1 0
Credits	4
Course Assessment Methods End Semester Assessment (University Exam.) Continuous Assessment (Sessional, Assignments, Quiz)	 50 50
Course Prerequisites	Data Communication and Networks (CS 501), Web Technologies (CS 402), Database Systems (CS 302)
Course Objectives (CO)	1. To introduce concepts of artificial neural networks and principles of leaning and regression. 2. To learn various types of neural networks and their working principles 3. To understand role of neural network in various applications and apply it to multi-class classification etc.
Course Outcome	1. Understand basic concepts of neural networks. 2. Use neural networks to perform classification for single class and multiclass problems. 3. Learn and apply the concept of self organizing maps.

SYLLABUS

Note for Examiner- *Examiner will set 7 questions of equal marks. First question will cover whole syllabus, having 10 conceptual questions of 1 mark each or 5 questions of 2 mark each and is compulsory. Rest of the paper will be divided into two parts having three questions each and the candidate is required to attempt at least two questions from each part.*

SECTION-A

Neural Network Basics

Classical AI and Neural Networks, characteristics of neural networks, Historical perspective, The biological inspiration, models of artificial neuron & activation functions, Artificial Neuron Model and Linear Regression, Nonlinear Activation Units and Training of artificial neural networks.
(6 hours)

Learning Mechanisms: Gradient Descent Algorithm, Learning Mechanisms-Hebbian, Competitive, Boltzmann , Universal function approximation.

(6 hours)

Single Layer and Multi layerPerceptrons:

Representation of perceptron, Linear separability, Perceptron Learning, Single-Layer Perceptions , Unconstrained Optimization: Gauss-Newton's Method, Linear Least Squares Filters, Least Mean Squares Algorithm , Perceptron Convergence Theorem , Back Propagation Algorithm, Practical Consideration in Back Propagation Algorithm Training of single layer and multi-layer, back propagation training algorithm, Applications of back propagation,

Solution of Non-Linearly Separable Problems Using MLP, Heuristics For Back-Propagation, Multi-Class Classification Using Multi-layered Perceptrons

(12 hours)

SECTION-B

Associative Memory Networks:- Associative Memory Model, Conditions for perfect Recall in Associative memory.

Radial Basis Function Networks: Introduction ,Separability and Interpolation, Learning Mechanisms in RBF, Comparison Between MLP and RBF

(5 hours)

Introduction to Principal Components and Analysis, Dimensionality reduction Using PCA, Hebbian-Based Principal Component Analysis

(5 hours)

Self OrganizingMaps : Introduction to Self Organizing Maps, Cooperative and Adaptive Processes in SOM, Vector-Quantization Using SOM, Competitive learning, Maxican Hat networks

(6 hours)

TEXT BOOKS			
S. No.	**NAME**	**AUTHOR(S)**	**PUBLISHER**
1	Neural Networks, fuzzy Logic, and Genetic Algorithms	Rajasekaran&Vijayalakhmi Pai	Pearson, 2011
2	Principles of Soft Computing	Sivanandam, Deepa	Wiley, 2014
3	Neural Networks – A Classroom Approach	Satish Kumar	Tata Mcgraw, 2010

Branch: Computer Science and Engineering

Course Code	**CS 755B**
Course Title	**NEURAL NETWORKS (Practical)**
Type of Course	Elective
L T P	0 0 3
Credits	1
Course Assessment Methods End Semester Assessment Continuous Assessment	 50

SYLLABUS

Practical based on Neural Networks syllabus.

Branch: Computer Science and Engineering

Course Code	**CS 705C**
Course Title	**CLOUD COMPUTING**
Type of Course	Core
L T P	3 1 0
Credits	4
Course Assessment Methods End Semester Assessment (University Exam.) Continuous Assessment (Sessional, Assignments, Quiz)	 50 50
Course Prerequisites	Data Communication and Networks(CS 501), Web Technologies(CS 402), Database Systems (CS 302)
Course Objectives (CO)	1. To introduce cloud computing, types of cloud services and enabling technologies. 2. To make them understand the role and usage of virtualization technologies. 3. To introduce cloud security issues and their resolution mechanisms. 4. To make them understand the features and usage of cloud platforms by studying the existing systems.
Course Outcome	1. Understand cloud based systems and enabling technologies. 2. Use virtualization technologies for enabling cloud services. 3. Identify security risks and their handling mechanisms in cloud environment. 4. Use cloud platforms to configure and host cloud services.

SYLLABUS

Note for Examiner- *Examiner will set 7 questions of equal marks. First question will cover whole syllabus, having 10 conceptual questions of 1 mark each or 5 questions of 2 mark each and is compulsory. Rest of the paper will be divided into two parts having three questions each and the candidate is required to attempt at least two questions from each part.*

SECTION-A

Cloud Computing Basics

Cloud Computing Overview; Characteristics; Applications; Internet and Cloud; Benefits; Limitations; Challenges; Cloud Computing Reference Architecture; Architectural Components; Cloud Computing Services and Deployment Models.

(7 hours)

Abstraction and Virtualization

Virtualization, Types of virtualization; Hardware Virtualization - full, partial, paravirtualization; Software Virtualization ; Memory Virtualization; Storage Virtualization; Data Virtualization; Network Virtualization; Nested Virtualization; Hypervisor- Type-1, Type-2; Hyperjacking.

(7 hours)

Cloud Storage

Cloud Storage – managed, unmanaged; Storage as a Service; Cloud Storage issues and challenges; Creating cloud storage system; Virtual storage containers; SAN, NAS, SAN vs. NAS

(7 hours)

SECTION-B

SMAC

SMAC-Social Media, Mobility, Analytics and Cloud; Big Data, Introduction to Hadoop, MapReduce; MapReduce steps

(7 hours)

Cloud Security

Cloud security issues and challenges; cloud security controls, dimensions of cloud security, Security and privacy, identity management, physical security, confidentiality, access controllability, integrity, Migration to cloud-issues, approaches

(5 hours)

Mobile Cloud Computing

Overview of Mobile Cloud Computing, Advantages, Challenges, Using Smartphones with the Cloud, Offloading techniques - their pros and cons, Mobile Cloud Security

(5 hours)

Cloud Computing Platforms

Introduction to cloud platforms: Google Cloud Platform – Google Compute Engine, Google App Engine, BigTable, BigQuery, Amazon Web Services, Microsoft Azure, IBM Bluemix, features of important cloud platforms.

(7 hours)

TEXT BOOKS			
S. No.	**NAME**	**AUTHOR(S)**	**PUBLISHER**
1	Cloud Computing: A Practical Approach	Anthony T. Velte, Toby J. Velte, and Robert Elsenpeter	McGraw Hill, 2010
2	Cloud Computing: Principles and Paradigms	RajkumarBuyys, James Broberg, Andrzej Goscinski (Editors)	Wiley, 2011
3	Cloud Computing Bible,	Barrie Sosinsky	Wiley, 2011
4	Cloud Computing for Dummies	Judith Hurwitz, Robin Bloor, Marcia Kaufman,Fern Halper	Wiley, 2010
5	Handbook of Cloud Computing	BorkoFurht, Armando Escalante (Editors)	Springer, 2010

Branch: Computer Science and Engineering

Course Code	**CS 755C**
Course Title	**CLOUD COMPUTING (Practical)**
Type of Course	Elective
L T P	0 0 3
Credits	1
Course Assessment Methods End Semester Assessment Continuous Assessment	 50

SYLLABUS

Practical based on Cloud Computing syllabus.

Branch: Computer Science and Engineering

Course Code	**CS 705D**
Course Title	**MOBILE COMPUTING**
Type of Course	Elective
L T P	3 1 0
Credits	4
Course Assessment Methods End Semester Assessment (University Exam.) Continuous Assessment (Sessional, Assignments, Quiz)	 50 50
Course Prerequisites	Data Communication and Networks (CS 501)
Course Objectives (CO)	1. To understand advanced element of learning in the field of wireless communication, wireless devices and mobile computing. 2. Knowledge of communication and networking principles that support connectivity to cellular and telecommunication networks, Wireless Internet and Sensor devices. 3. To understand the use of transaction and e-commerce principles over such devices to support mobile business concepts 4. Designing and Implementation of various applications related to mobile computing
Course Outcome	1. Knowledge of wireless communication and current telecommunication technologies 2. Understanding of the characteristics and limitations of mobile hardware devices including their user-interface modalities 3. Understanding of MANETs routing algorithms and its implementation 4. Ability to develop applications that are mobile-device specific and demonstrate current practice in mobile computing contexts

SYLLABUS

Note for Examiner- *Examiner will set 7 questions of equal marks. First question will cover whole syllabus, having 10 conceptual questions of 1 mark each or 5 questions of 2 mark each and is compulsory. Rest of the paper will be divided into two parts having three questions each and the candidate is required to attempt at least two questions from each part.*

SECTION-A

Mobile Devices and Systems

Cellular Networks and Frequency Resuse, Mobile Smartphones, Smart Mobiles and Systems, Handheld Devices, Smart Systems, Limitations of Mobile Devices and Automative Systems

(6 hours)

GSM and Other Architectures

Modulation, Multiplexing, Controlling the Medium Access, GSM, Radio Interfaces, Protocols, Localization, Call Handling, Handover, Security, GPRS, Spread Spectrum, FHSS, CDMA, WCDMA, CDMA 2000, OFDM, HSPA, WiMAX, Broadband Wirless access, 4G Networks

(7 hours)

Mobile IP Network Layer

Mobile Network Layer Mobile IP Goals, Assumptions and Requirements, Entities, IP packet Delivery Agent Advertisement and Discovery, Registration.Tunneling and Encapsulation, Optimization Reverse Tunneling, IPv6, DHCP.

(7 hours)

SECTION-B

Mobile Transport Layer

Mobile Transport Layer & Wireless Application Protocol Traditional TCP, Indirect TCP, Snooping TCP, Mobile TCP, Transmission / Timeout Freezing Selective Retransmission, Transaction oriented TCP. Architecture, Datagram Protocol, Transport Layer Security, Transaction Protocol, Session Protocol, Application Environment , Wireless Telephony.

(8 hours)

Databases and Mobile Computing

Data Organization, Database Transaction Models, Query processing, Recovery process, Data Caching, Context Aware Mobile Computing

(5 hours)

Mobile Ad-Hoc and Wireless Sensor Networks

MANET-architecture, properties, Spectrum, Applications, Routing Algorithms- DSR, AODV, TORA, OLSR

(5 hours)

Mobile Application Languages and Mobile Application Development Platforms

Mobile Application Development, XML, JAVA, Java 2 Micro Edition, OS, Windows Phone, Android.

(7 hours)

TEXT BOOKS			
S. No.	**NAME**	**AUTHOR(S)**	**PUBLISHER**
1	Mobile Computing	Raj Kamal	2nd edition, Oxford, 2012
2	Mobile Communication	J Schiller	2nd edition, Addison Wesley, 2006
RECOMMENDED BOOKS			
1	Mobile Communication Design Fundamentals	William C . Y Lee	2nd edition, John Wiley, 1993
2	Wireless Communication and Networks,	William Stallings	2nd edition, Pearson Education, 2009
3	WAP-Wireless Application Protocol	Sandeep Singhla, Thomas Bridgman, LalithaSuryanarayana	2nd edition, Pearson Education, 2006

Branch: Computer Science and Engineering

Course Code	**CS 755D**
Course Title	**MOBILE COMPUTING (Practical)**
Type of Course	Elective
L T P	0 0 3
Credits	1
Course Assessment Methods End Semester Assessment Continuous Assessment	 50

SYLLABUS

Practical based on Mobile Computing syllabus.

Branch: Computer Science and Engineering

Course Code	**CS 705E**
Course Title	**SMART SYSTEM DESIGN**
Type of Course	Elective
L T P	3 1 0
Credits	4
Course Assessment Methods End Semester Assessment (University Exam.) Continuous Assessment (Sessional, Assignments, Quiz)	 50 50
Course Prerequisites	None
Course Objectives (CO)	1. This course shall introduce various MEMS, NEMS based smart system technologies. This would help them to process the acquired data from real world so as to make the system smart
Course Outcome	1. Understand basics of sensor based applications, 2. Analyze the data acquired using sensor. 3. Understand different ways to communicate with sensors . 4. Design a simple application sensors and IoT

SYLLABUS

Note for Examiner- *Examiner will set 7 questions of equal marks. First question will cover whole syllabus, having 10 conceptual questions of 1 mark each or 5 questions of 2 mark each and is compulsory. Rest of the paper will be divided into two parts having three questions each and the candidate is required to attempt at least two questions from each part.*

SECTION-A

Introduction: Main definitions for smart sensors and its properties, quasi-digital sensors, MTS, MEMS and system-on-chip (SoC); Sensors classifications from output point of view and quasi-digital sensors classification; Sensors architectures for integrated and smart sensors; Informative parameters (unified and frequency-time domain parameters of signal); Advantages of frequency as informative parameter including high noise immunity, high power of signal, wide dynamic range, high reference accuracy, simple interfacing, simple Integration and coding.

(12 hours)

Digital Sensors and Smart Sensors System Design: Practical realizations of different smart sensors systems and digital sensors: optical sensors systems with color-to-digital and light-to-digital converters; a DAQ system for temperature sensors; accelerometers based systems; rotation speed digital sensors and systems; digital humidity sensors and data loggers; temperature and humidity multisensors system; pressure sensors systems and digital gauges; digital magnetic sensors and systems; multiparameters sensors systems.

(12 hours)

SECTION-B

IEEE 1451 Standard and Frequency Sensors: Brief introduction to IEEE 1451 standard and its extension for any sensors and transducers from frequency-time signal domain. Direct Sensor-to-Microcontroller Interface for resistive, capacitance, inductance, resistive bridges sensing elements. Future Trends - The future development of main systems' components as the Universal Frequency-to-Digital

Converter (UFDC-2) and Universal Sensors and Transducers Interface (USTI).Integration of all components of sensor system into a single system-on-chip (SoC) with advanced processing and conversion methods.

(13 hours)

Internet of Things: Basic Introduction and communication mechanism, various applications in different fields, Case Study

(8 hours)

TEXT BOOKS			
S. No.	**NAME**	**AUTHOR(S)**	**PUBLISHER**
1	Handbook of Modern Sensors: Physics, Designs, and Applications.	Fraden, J.	4th edition, Springer, India, 2010
2	Understanding the Smart Sensors	Frank. R,	2nd edition, Artech House, 2010
3	Smart Sensor Systems by 2008	Meijer.M. C.G ,	Latest edition, John Willey & Sons Ltd, 2008
4	Introduction to Instrumentation, Sensors and Process Control	Dunn. C. W	Latest edition, Artech House
RECOMMENDED BOOKS			
1			

Branch: Computer Science and Engineering

Course Code	**CS 755E**
Course Title	**SMART SYSTEM DESIGN (Practical)**
Type of Course	Elective
L T P	0 0 3
Credits	1
Course Assessment Methods End Semester Assessment Continuous Assessment	 50

SYLLABUS

Practical based on Smart System Design syllabus.