DR. BABASAHEB AMBEDKAR MARATHWADA UNIVERSITY
CIRCULAR NO.SU/Engg./B.E./03/2019

It is hereby informed to all concerned that, the syllabi prepared by the Board of Studies & recommended by the Dean, Faculty of Science & Technology the has accepted the following syllabi in accordance with Choice Based Credits & Grading System for all Branches of B.E. Final Year in his emergency powers under section 12(7) of the Maharashtra Public Universities Act, 2016 on behalf of the Academic Council and Management Council as enclosed herewith:-

<table>
<thead>
<tr>
<th>Sr.No.</th>
<th>Syllabi as per CBC &amp; GS</th>
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<tr>
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<td>Final Year B.E. [Civil Engineering],</td>
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<td>Final Year B.E [Chemical Engineering],</td>
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<td>[5]</td>
<td>Final Year B.E [Instrumentation Engineering],</td>
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<td>[7]</td>
<td>Final Year B.E [CSE/IT],</td>
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This is effective from the Academic Year 2019-2020 and onwards.

All concerned are requested to note the contents of this circular and bring the notice to the students, teachers and staff for their information and necessary action.

University Campus,
Aurangabad-431 004.
Ref No. SU/2019/387 - 619
Date: 24-07-2019.

Copy forwarded with compliments to:-
1) The Principals, affiliated concerned Colleges, Dr. Babasaheb Ambedkar Marathwada University.
2) The Director, University Network & Information Centre, UNIC, with a request to upload this Circular on University Website.

Copy to: -
1) The Director, Board of Examinations & Evaluation,
2) The Section Officer, [Engineering Unit] Examination Branch,
3) The Section officer, [Eligibility Unit],
4) The Programmer [Computer Unit-1] Examinations,
5) The Programmer [Computer Unit-2] Examinations,
6) The In-charge, [E-Suvidha Kendra],
7) The Public Relation Officer,
8) The Record Keeper,
Curriculum of

B.E.

Computer Science and Engineering

Under Choice Based Credit & Grading System

UNDER THE FACULTY OF SCIENCE & TECHNOLOGY.

[ Effective from 2019-20 & onwards ]
## Curriculum structure of BE (Computer Science and Engineering)

### PART-I

<table>
<thead>
<tr>
<th>Sub Code</th>
<th>Part-I</th>
<th>Contact Hrs/Week</th>
<th>Examination Scheme</th>
<th>Duration of Theor y Examination</th>
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<td>CSE401</td>
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<td>Principles of Compiler Design</td>
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**Elective – IV:**

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L: Lecture hours per week    T: Tutorial hours per week    P: Practical hours per week
CT: Class Test    TH: University Theory Examination,    TW: Term Work,    PR: Practical/Oral Examination
## PART - II

### Contact Hrs/Week

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### Examination Scheme

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### Total of Semester I & II

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**Elective - V:**

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<tr>
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<td>Game Architecture &amp; Design</td>
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<tr>
<td>CSE494</td>
<td>Human Computer Interface</td>
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**L:** Lecture hours per week  
**T:** Tutorial hours per week  
**P:** Practical hours per week  
**CT:** Class Test  
**TH:** University Theory Examination,  
**TW:** Term Work,  
**PR:** Practical/Oral Examination
Course Code: CSE401      Title: Data Warehousing and Data Mining
Teaching Scheme: 04 Hours/Week  Examination Scheme: Class Test: 20 Marks
                  Theory Examination (Marks): 80 Marks
                  Theory Examination (Duration): 03 Hours

Prerequisite:
1. Database Management Systems

Objectives:
1. To introduce basic principles, concepts and applications of data warehousing.
2. To introduce students to the basic concept of Data Mining & preprocessing.
3. To introduce a wide range of Association, classification, clustering, classification algorithms.
4. To introduce basic concept of BI.

CONTENTS
SECTION-A

Unit 1: Data Warehousing:[6Hrs]
Data Warehouse: Basic Concepts, A Multitiered Architecture, Enterprise Warehouse, Data
Mart, Extraction, Transformation, and Loading, Metadata Repository.

Unit 2: Data Warehouse Modeling and Implementation:[8Hrs]
Data Cube: A Multidimensional Data Model, Stars, Snowflakes, and Fact Constellations: Schemas for
Multidimensional Data Models, Dimensions: The Role of Concept Hierarchies, Measures: Their
Categorization and Computation, Typical OLAP Operations, Know your Data: Data objects and Attribute
Types, Basic Statistical Descriptions of Data, Measuring Data Similarity and Dissimilarity, Data
Preprocessing: An Overview.

Unit 3: Data Mining:[6Hrs]
Introduction: Data, Types of Data, Data Mining Functionalities, Interestingness of Patterns, Classification
of Data Mining Systems, Data Mining Task Primitives, Integration of a Data Mining System with a Data
Warehouse, Issues, Data Preprocessing.

SECTION-B

Unit 4: Association Rule Mining and Classification:[8 hrs]
Mining Frequent Patterns, Associations and Correlations, Mining Methods, Mining various Kinds of
Association Rules, Correlation Analysis, Constraint Based Association Mining, Classification and
Prediction, Basic Concepts, Decision Tree Induction, Bayesian Classification, Rule Based
Classification, Support Vector Machines, Regression Models.

Unit 5: Clustering:[6Hrs]
Introduction, Clustering, Cluster Analysis, Clustering Methods- K means, Hierarchical clustering,
Agglomerative clustering, Divisive clustering, Introduction to Web Mining: Web Content Mining, Web
Structure Mining, Web Usage Mining.
Unit 6: Business Intelligence: [6Hrs]
Introduction, Business Intelligence, Business Intelligence tools, Business Intelligence Infrastructure, Business Intelligence Applications, BI versus Data Warehouse, BI versus Data Mining, Future of BI.

TextBooks:
1. Jiawei Han and Micheline Kamber, Data Mining: Concepts and Techniques, Third Edition, Elsevier Publication.

Reference Books
1. Business Intelligence: A Managerial Approach (2nd Ed.) Turban, Sharda, Delen, King, Wiley Publication

Pattern of Question Paper:
Six units in the syllabus shall be divided in two equal parts i.e. 3 units in each part. Question paper shall be set having two sections A and B. Section A questions shall be set on first part and Section B questions on second part. Question paper should cover the entire syllabus.

For 80 marks Paper:
1. Minimum ten questions
2. Five questions in each section
3. Question no. 1 from section A and Question no. 6 from section B, 10 marks each, will be compulsory.
4. From the remaining questions in section A and B students are supposed to solve any two questions, 15 marks each.
Dr. BABASAHEB AMBEDKAR MARATHWADA UNIVERSITY, AURANGABAD  
FACULTY OF SCIENCE AND TECHNOLOGY  
Final Year Engineering (CSE)  
Part-I

Course Code: CSE402  
Title: Principals of Compiler Design  
Teaching Scheme:  
Theory: 04Hours/Week  
Examination Scheme:  
Class Test: 20 Marks  
Theory Examination (Marks): 80 Marks  
Theory Examination (Duration): 03 Hours

Prerequisite:  
2. Basic Knowledge of subject ‘Theory of Computation’.  
3. Programming skills in basic programming language like C.

Objectives:  
1. To get working knowledge of the major phases of compilation, like lexical analysis, parsing, semantic analysis and code generation.  
2. To use the formal attributed grammars for specifying the syntax and semantics of programming languages.  
3. To learn and use tools for compiler construction.  
4. To understand the structure of a compiler, and how the source and target languages influence various choices in the design.

SECTION A

Unit 1: Introduction to compilers: [6 Hrs]  
Compilers & translators, structure of compilers, bootstrapping, compiler construction tools. Programming language basics.

Unit 2: Lexical analysis: [6 Hrs]  

Unit 3: Syntax Analysis: [8 Hrs]  
Role of Parser, shift reduce parsing, top down parsing, Predictive parsing – Computation of FIRST & FOLLOW functions and construction of parsing table, LR parsers, the canonical collection of LR (0) items, LALR parser, Automatic parser Generator YACC, YACC programs, Error detection and correction with YACC.

SECTION B

Unit 4: Syntax Directed Translation (SDT): [8 Hrs]  
Syntax-Directed Definitions, Construction of Syntax Trees, Bottom-Up Evaluation of S-Attributed Definitions, L-Attributed Definitions, Top Down Translation, Bottom-Up Evaluation of Inherited Attributes, Type Checking: Type Systems, Specification of a Simple Type Checker, Equivalence of Type Expressions, Type conversions.

Unit 5: Intermediate Code Generation, Symbol Table, Error detection and Recovery: [6 Hrs]  
Intermediate Code: Postfix notation, parser trees and syntax trees, three address codes – Quadruples and triples, indirect triples, Contents of Symbol table, data structures for symbol tables, representation scope information, Errors, Lexical-phase errors, syntactic-phase errors, semantic errors.
Unit 6: Code Optimization: [6 Hrs]
Principal sources of optimization, loop optimization - Basic blocks, flow graphs, loops, code
motion, induction variables, DAG representation of basic blocks, Application of DAGs, Global
Data Flow Analysis, Data Flow equations. Loop unrolling, loop jamming, constant folding, Object
programs: the environment of code, generator, run-time addresses for names, Problems in code
generation, A machine model, working of a simple code generator in brief, Register allocation and
assignments, Peephole optimization.

Text Books:

Reference Books:

Pattern of Question Paper:
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be set having two sections A and B. Section A questions shall be set on first part and Section B questions
on second part. Question paper should cover the entire syllabus.

For 80 marks Paper:
1. Minimum ten questions
2. Five questions in each section
3. Question no. 1 from section A and Question no. 6 from section B, 10 marks each, will be compulsory.
4. From the remaining questions in section A and B students are supposed to solve any two questions
   from each section, 15 marks each.
Course Code: CSE403  
Title: - Object Oriented Software Modeling and Design

Teaching Scheme:  
Theory: 4 Hours/Week

Examination Scheme:  
Class Test: 20 Marks
Theory Examination (Marks): 80 Marks
Theory Examination (Duration): 03 Hour

Prerequisite:
1. Students should have prior knowledge of software engineering.
2. Students should have idea of software development life cycle.
3. Students should have knowledge of object oriented concepts.

Objectives: Students will be able to:
1. Design a software project using Object Oriented Modeling
2. Design a software project using Design Patterns
3. Design an Object-Oriented Software

CONTENTS

SECTION-A: SOFTWARE MODELLING

Unit 1: Introduction:  
[6 hrs]
- Complexity of Software, Algorithmic and Object-Oriented Decomposition
- Software Modeling: Object-Oriented Methods and the Unified Modeling Language
- Software Architectural Design: Method and Notation
- UML as a Standard
- Multiple Views of Software Architecture
- Evolution of Software Modeling and Design Methods
- Evolution of Object-Oriented Analysis and Design Methods
- Survey of Concurrent, Distributed, and Real-Time Design Methods

Unit 2: UML Modeling:  
[8 hrs]
   Use case: Finding use cases, use cases in UML, Relationship between use cases.
   Use Case Description: Types of use cases, elements of use case Description, Guidelines for Creating Use cases descriptions, organizing use cases, describing use cases, realizing use cases and Use case Diagrams.

Unit 3: Behavioral Modeling:  
[6 hrs]
Behavioral Models, Interaction Diagrams: Objects, operations and messages, Sequence diagram, Communication diagram. State machine diagram.
Activity Diagram: elements of activity diagram, guidelines for creating Activity diagram
Component diagram, deployment diagram.

NOTE: Proposed Case Study for Unit 2 & 3:
- Online banking, Institute Management System, Library Management System
SECTION-B: DESIGN PATTERNS

Unit 4: User Interface Design: [6 hrs]
- The Golden Rules
- User Interface Design
- Task Analysis and Modeling
- Interface Design Activities
- Implementation Tools
- Design Evaluation

Unit 5: Introduction to Design Patterns [8 hrs]
- What is a Design Pattern?
- The Catalog of Design Patterns
- Organizing the Catalog
- Creational Design Pattern
  - Intent, applicability, structure, collaborations, consequence, implementations
  - Abstract Factory
  - Prototype
  - Singleton

Unit 6: Structural and Behavioral Design Patterns [6 hrs]
- Intent, applicability, structure, collaborations, consequence, implementations
- Structural Patterns: Adapter, Bridge, Composite,
- Behavioral Patterns: Chain of responsibility, Command, Iterator

NOTE: Case Study for Unit 5 and 6: Document Editor.

Text Books:

Reference Books:
3. Hank-Erik Eriksson, Magnus Penkar, Brian Lyons, David Fado, "UML 2 Tool Kit" OMG Press

Pattern of Question Paper:
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For 80 marks Paper:
1. Minimum ten questions
2. Five questions in each section
3. Question no. 1 from section A and Question no. 6 from section B, 10 marks each, will be compulsory.
4. From the remaining questions in section A and B students are supposed to solve any two questions, 15 marks each
Course Code: CSE404     Title: Cloud Computing
Teaching Scheme: Examination Scheme:
Theory: 4Hours/Week    Class Test: 20 Marks
Prerequisite:
1. Computer Network
2. Parallel & Distributed Computing

Objectives:
1. To learn and understand basic concepts of Cloud Computing & its Models.
2. To learn and understand Cloud Technologies
3. To design, develop and deploy Cloud applications
4. To get acquainted with the challenges and security aspects of Cloud Computing.
5. To study Mobile Cloud Applications

CONTENTS
SECTION-A

Unit 1: Introduction to Cloud Computing[6 Hrs]
- Introduction to Mainframe architecture & Client-server architecture,
- Parallel & Distributed Computing, Cluster & Grid Computing
- Definition and Evolution of Cloud Computing, the Vision of Cloud Computing,
- Cloud Deployment Models, Cloud Service Models, Key Characteristics, Benefits, Risks & Challenges in Cloud Computing,
- Service oriented architecture (SOA) and Cloud Computing Reference Architecture by IBM.

Unit 2: Cloud Services & Infrastructure[8 Hrs]
Cloud Services:Model architecture, Benefits and Drawbacks:
- Infrastructure-as-a-Service (IaaS),
- Platform-as-a-Service (PaaS),
- Software-as-a-Service (SaaS),
- Identity-as-a-service (IDaaS),
- Storage-as-a-service.
- Case Study: Platform as a Service: Google App Engine

Cloud Infrastructure:
- Historical Perspective of Data Centers
- Datacenter Components: IT Equipment and Facilities
- Design Considerations: Requirements, Power, Efficiency, & Redundancy, Power and Challenges in Cloud Data Centers

Unit 3: Enabling Cloud Technologies[6 Hrs]
- Web services: XML, SOAP, REST
- **Virtualization**: Introduction to virtualization, Hypervisor: Type-I & Type II, Types of Virtualization, Pros and cons of virtualization,
- **Virtualization applications in enterprises**: Server virtualization, Desktop and Application Virtualization, Storage and Network Virtualization. Case Study: Amazon EC2

**SECTION-B**

**Unit 4: Basics of Hadoop** [6Hrs]
- **Big Data**, Concept of Big Data, Challenges in Big Data,
- **Hadoop**: Definition, Architecture,
- **Introduction to Storage Systems**: Cloud Storage Concepts Distributed File Systems (GFS, HDFS), Cloud Databases (Hbase, Big Table), Cloud Object Storage (Amazon S3), MapReduce and extensions: Parallel computing, The MapReduce model: Parallel efficiency of MapReduce
- **Projects in Hadoop**: Hive, Spark, Pig, Oozie, Flume.

**Unit 5: Security in the Cloud** [8Hrs]

**Unit 6: Mobile Cloud & Latest Cloud Technology Services** [6Hrs]
**Mobile Cloud**: Adopting mobile cloud applications, Using Smartphones with the cloud: Android, Apple
**Working with Mobile Web Services**: Mobile Interoperability.
**Performing Service Discovery**: Context-aware services, MEMS, Location awareness & its Strategies, Push Services, Defining WAP and Other Protocols.

**Text Books:**
3. IBM smart storage cloud Red paper by Larry Coyne Mark Bagley Gaurav Chaunker

**Reference Books:**
1. Cloud computing Bible by Barrie Sosinsky, Wiley India Pvt Ltd (2011)
3. Harnessing Green IT Principles & Practices by San Murugesan, G. R. Gangadharan

**PATTERN OF QUESTION PAPER:**
Six units in the syllabus shall be divided in two equal parts i.e. 3 units in each part. Question paper shall be set having two sections A and B. Section A questions shall be set on first part and Section B questions on second part. Question paper should cover the entire syllabus.

**For 80 marks Paper:**
1. Minimum ten questions
2. Five questions in each section
3. Question no. 1 from section A and Question no. 6 from section B, 10 marks each, will be compulsory.
4. From the remaining questions in section A and B students are supposed to solve any two questions, 15 marks each.
Prerequisites:
1. Awareness of basics of software engineering concepts and waterfall methodology.
2. Exposure to any object-oriented programming language such as Java, C#.

Objectives:
1. To understand the background and driving forces for taking an Agile approach to software development.
2. To understand the business value of adopting agile approaches.
3. To understand the Agile development practices.
4. To drive development with unit tests using Test Driven Development.
5. To Apply design principles and refactoring to achieve Agility.
6. To deploy automated build tools, version control and continuous integration.

CONTENTS

SECTION-A

Unit 1: Fundamentals of Agile [6 Hrs]

Unit 2: Agile Scrum Framework [8 Hrs]
Introduction to Scrum, Project phases, Agile Estimation, Planning game, Product backlog, Sprint Backlog, Iteration planning, User story definition, Characteristics and content of user stories, Acceptance tests and Verifying stories, Project velocity, Burn down chart, Sprint planning and Retrospective, Daily scrum, Scrum roles – Product Owner, Scrum Master, Scrum Team, Scrum case study, Tools for Agile project management, Case study using SCRUM.

Unit 3: Agile Processes [6 Hrs]
Extreme Programming, Lean software development, Test Driven Development, Feature Driven Development, Kanban, Requirements in Agile Context, Attributes of Agile Requirements, Requirements Engineering in Agile Software Development

SECTION-B

Unit 4: Agile Software Design Principles [6 Hrs]
Unit 5: Agile Testing [8 Hrs]
The Agile lifecycle and its impact on testing, The Differences between Testing in Traditional and Agile Approaches, Role and Skills of a Tester in an Agile Team, Test-Driven Development (TDD), x Unit framework and tools for TDD, Testing user stories - acceptance tests and scenarios, Planning and managing testing cycle, Exploratory testing, Risk based testing, Regression tests, Test Automation, Tools to support the Agile tester.

Unit 6: Industry Trends [6 Hrs]
Market scenario and adoption of Agile, Agile maturity model, Introduction to DevOps, Agile ALM, Roles in an Agile project, agile applicability, Agile in Distributed teams, Business benefits, Challenges in Agile, Risks and Mitigation, Agile projects on Cloud, Balancing Agility with Discipline, Agile rapid development technologies.

Text Books:
1. Agile Software Development with Scrum by Ken Schawber, Mike Beedle Publisher: Pearson
4. Publisher: Addison Wesley Published: 30 Dec 2008.

Reference Books:

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4. From the remaining questions in section A and B students are supposed to solve any two questions, 15 marks each.
Dr. BABASAHEB AMBEDKAR MARATHWADA UNIVERSITY, AURANGABAD  
FACULTY OF SCIENCE AND TECHNOLOGY  
Final Year Engineering (CSE)  
Part-I

Course Code: CSE442      Title: Elective-IV:Remote Sensing & Geographical Information Systems  
Teaching Scheme:    Examination Scheme:  
Theory: 4 Hours/Week    Class Test: 20 Marks  
Theory Examination (Marks): 80 Marks  
Theory Examination (Duration):03 Hours

Prerequisite:
1. Image processing  
2. Computer Graphics

Objectives:
1. To get acquainted with the concepts of Earth observation and remote data acquisition techniques.  
2. To understand the concepts of remotely sensed data processing and visualization. 
3. To apply data processing and visualization methods 
4. To perform data processing and visualization methods for number of earth science applications, including Geographical Information System.

CONTENTS

SECTION-A

Unit 1: Fundamental of Remote Sensing [7 Hrs]

Unit 2: Remote Sensing Platforms and Sensors [6 Hrs]
Platforms, Types of sensors, Sensor resolutions, Passive and Active sensors, Optical sensors, Classification of RS, Selection of sensor parameter, Spatial resolution, Spectral resolution, Radiometric resolution, Temporal resolution, Band combinations and optimum index factor, False and pseudo colour composites, Errors in imaging process.

Unit 3: Visual Image Interpretation [7 Hrs]
Elements of image interpretation, Interpretation key, Hardware and software aspects of digital image processing, Concept of data editing, Properties of digital remote sensing data, concept of geo-referencing, Errors due to geo-referencing, Physical and mathematical models, Hybrid models, Rectification of Images, Interpolation methods in the rectification of images, nearest neighbor, bilinear and bi-cubic methods, Concepts of world file and embedding of projection information in the images.
SECTION-B

Unit 4: Remote Sensing Image Processing [7 Hrs]

Unit 5: Geographic Information System [6 Hrs]
Definition of GIS, Elements of GIS, Coordinate system, Need for GIS, Data models, Raster and vector, GIS data acquisition, Data input for GIS, Integration of satellite images, Aerial photographs and GIS, Concept of web GIS.

Unit 6: Data Exploration & Analysis [7 Hrs]
Data display and Cartography, Data exploration, Vector data analysis, Raster data analysis, Terrain Mapping and analysis.

Text Books:

Reference Books:

Pattern of Question Paper:
Six units in the syllabus shall be divided in two equal parts i.e. 3 units in each part. Question paper shall be set having two sections A and B. Section A questions shall be set on first part and Section B questions on second part. Question paper should cover the entire syllabus.

For 80 marks Paper:
1. Minimum ten questions
2. Five questions in each section
3. Question no. 1 from section A and Question no. 6 from section B, 10 marks each, will be compulsory.
4. From the remaining questions in section A and B students are supposed to solve any two questions, 15 marks each.
Course Code: CSE443       Title: Elective-IV: Internet of Things

Teaching Scheme: Examination Scheme:
Theory: 4 Hours/Week Class Test: 20 Marks
Theory Examination (Marks): 80 Marks
Theory Examination (Duration): 03 Hours

Prerequisite:
1. Introductory course on Computer Networks
2. Sensors Technology

Objective:
1. An Understanding of the IoT value chain structure (device, cloud, data), application area and technologies involved
2. IoT applications and example overview
3. An Understanding of various sensor technologies

CONTENTS

SECTION-A

UNIT I: FUNDAMENTALS OF IoT: [6 Hrs]
Internet of Things Definitions, Uses and Applications of IoT, IoT Architectures: one M2M, IoT World Forum (IoTWF) and Alternative IoT models – Simplified IoT Functional blocks of an IoT, IoT implementation, platforms and integration tools.

UNIT II: IoT PROTOCOLS and Sensors: [8 Hrs]

UNIT III: Design and Developments: [6 Hrs]
Design Methodology - Embedded computing logic - Microcontroller, System on Chips - IoT system building blocks - Arduino - Board details, IDE programming - Raspberry Pi - Interfaces and Raspberry Pi with Python Programming.

SECTION-B

UNIT IV: Data Acquisition and Supporting Services: [6 Hrs]
Criteria for sensors selection, designing of sampling time of data acquisition, selection criteria for actuators, exchanging messages using TCP and UDP, serving web pages with dynamic data, Serving Web pages that respond to user input.
Unit V: Cloud and IoT: [6 Hrs]
Introduction to cloud storage models and communication API’s, WAMP-AutoBahn for IoT, Pythonweb application framework, AMAZON web services for IoT, SkyNet IoT messaging platform

UNIT VI Case Studies: [8 Hrs]
1. Home automation
2. Traffic light system
3. Home security
In each case study, it is expected to elaborate: Problem identification, functional and non-functional requirements, System design, Sensor and Actuators selection, Deployment architectures and pseudo code for all modules.

Text Books:
4. Embedded Ethernet and Internet complete, Jan Axelolson, Penram International Publishing Pvt Ltd.

Pattern of Question Paper:
Six units in the syllabus shall be divided in two equal parts i.e. 3 units in each part. Question paper shall be set having two sections A and B. Section A questions shall be set on first part and Section B questions on second part. Question paper should cover the entire syllabus.

For 80 marks Paper:
1. Minimum ten questions
2. Five questions in each section
3. Question no. 1 from section A and Question no. 6 from section B, 10 marks each, will be compulsory.
4. From the remaining questions in section A and B students are supposed to solve any two questions, 15 marks each.
Course Code: CSE421
Teaching Scheme:
Practical: 02 Hours/Week

Title: LAB-I Data Warehousing and Data Mining
Examination Scheme:
Practical /Oral Examination: 50 Marks
Practical /Oral Examination (Duration): 03 Hours

Suggestive List of Practicals/Assignments: (Min. 8 experiments to be conducted)

Design, develop and implement the following Assignments by

1. Implementation of Varying Arrays and Nested Tables
2. Implementation of OLAP operations
3. Implementation of Apriori Algorithm
4. Implementation of Naive Bayesian classification
5. Create data-set in .arff file format. Demonstration of preprocessing on WEKA data-set
6. Demonstration of Association rule process on data-set contact lenses.arff /supermarket using apriori algorithm
7. Demonstration of classification rule process on WEKA data-set using j48 algorithm
8. Demonstration of classification rule process on WEKA data-set using Naive Bayes algorithm

Practical Examination:

Practical Examination should be conducted by internal examiner for three hours under the supervision of external examiner. External examiner should evaluate student by checking practical performance and conducting viva.
Course Code: CSE422                                                Title: LAB-II Principles of Compiler Design
Teaching Scheme:                                                                      Examination Scheme:
Practical: 02 Hours/Week                                                        Practical /Oral Examination: 50 Marks
Practical /Oral Examination (Duration): 03 Hours

Suggestive List of Practical Assignments: (Min. 8 experiments to be conducted)
Design, develop and implement the following Assignments .......

1. Program to convert Non-deterministic finite automaton (NFA) to Deterministic finite automaton (DFA).
2. Program to generate lexical tokens.
3. Study of LEX/FLEX and write LEX program to identify tokens: integer, decimal numbers, identifiers, keywords, arithmetic operators, relational operators.
4. Program to implement LR-parser.
5. YACC program for desktop calculator.
6. Program to implement any one code optimization technique.
8. Implementation of code generator.

Assignment No.: 1 Case Study: GCC, G++ compiler
Assignment No.: 2 Case Study: Parallel Compilation (NVCC), LLVM compiler

Practical Examination:

Practical Examination should be conducted by internal examiner for three hours under the supervision of external examiner. External examiner should evaluate student by checking practical performance and conducting viva.
Course Code: CSE423                             Title: LAB-III Cloud Computing
Teaching Scheme:                                      Examination Scheme:
Practical: 2 Hours/Week                                                        Practical /Oral Examination: 50 Marks
                                                                                     Practical /Oral Examination (Duration): 03 Hours

Suggestive List of Practical Assignments:
Design, develop and implement the following Assignments …….

1. Study of Basic Concepts in Cloud Computing
3. Implementation of SOAP Web services in C#/JAVA Applications.
4. Implementation of Full-Virtualization by the use of a Hypervisor.
5. Implementation of Para-Virtualization by the use of a Hypervisor.
7. To study Cloud security challenges.
8. Case Study: PAAS (Facebook, Google App Engine)
10. To study the Basics of Hadoop Eco-system

Practical Examination:

Practical Examination should be conducted by internal examiner for three hours under the supervision of external examiner. External examiner should evaluate student by checking practical performance and conducting viva.
Course Code: CSE424  
Title: LAB-IV-(Elective-IV) Agile Methodology

Teaching Scheme:
Practical: 02 Hours/Week

Examination Scheme:
Term Work: 50Marks

Suggestive List of Practical Assignments:
Design, develop and implement the following Assignments

1. Understand the background and driving forces for taking an Agile approach to software development.
2. Understand the business value of adopting Agile approaches.
3. Understand the Agile development practices.
4. Apply design principles and refactoring to achieve Agility.
5. Drive development with unit tests using Test Driven Development.
6. Deploy automated build tools, version control and continuous integration.
7. Agile projects on Cloud
8. Perform testing activities within an agile project.

Term Work:
The term work shall consist of at least 8 experiments/ assignments based on the syllabus above.

Assessment of term work should be done as follows

- Continuous lab assessment
- Actual practical performance in Laboratory
Course Code: CSE425
Title: LAB-IV: Elective-IV: Remote Sensing & Geographical Information Systems

Teaching Scheme:
Practical: 2 Hours/Week

Examination Scheme:
Term Work: 50 Marks

Suggestive List of Practical Assignments:
Minimum 8 assignments should be conducted.

(Software: ILWIS / GRASS/ QGIS/ ArcGIS)

1. Reading and importing a raster dataset into RS/ GIS software and creating a subset.
2. Image Processing filters: smoothing and edge detection filtering
3. Image Classification: Unsupervised Classification
4. Image Classification: Supervised Classification
5. Image Classification: Accuracy Assessment
6. Image geo- referencing and understanding projections
7. Image fusion with images of two different resolutions
8. Digitization of point, line and polygon features
9. Composition of maps
10. Connecting with map, google map or bing map for mapping

Term Work:

Term Work shall consist of at least 8 experiments / assignments based on the syllabus above. Assessment of term work should be done as follows
• Continuous lab assessment
• Actual practical performance in laboratory
Suggested list of Assignments:
1. Study of Raspberry-Pi, Arduino, verify practically pin functions of each board.
2. Installation of OS on Raspberry-Pi, verify board’s functionality after OS installation
3. Study of functionality of various sensors and its data sheets, it is expected to study
   Range of parameters, range of environmental parameters in which it can work, precision and how to
   calibrate it.
4. Implement interfacing of LEDs. Understanding GPIO and its use in program.
5. Design and implement an application which will monitor temperature and it will be indicated by
   either buzzer or LED if crossed its threshold value.
6. Design and implement an application with IR sensor to detect water level of a tank & display the
   message if tank is empty or full, after crossing its threshold value.
7. Write a program of connectivity of Raspberry-Pi board with any Internet Module/Cloud. Write a
   network application for communication between two devices.
8. Design and implement traffic light system considering following aspects
   - Consider one cross road
   - Study density of traffic on that cross road
   - Classify the traffic in heavy, medium and light weight
   - Design duty cycle of Green, Yellow and Red light
   - Write a program and simulate the scenario
9. Design an application for home security considering following aspects:
   Consider an isolated bungalow located near slum area and crowded place where there
   is Compound but no security guard:
   - Analyze the scenario
   - Write security policy
   - Identify IoT mechanisms
   - How will you deploy the same
10. Design an application for home security considering following aspects:
    Consider a bungalow located in a society where there is complete compound and 24X7
    security guard is available
    - 1.Analyze the scenario
    - 2.Write security policy
    - 3.Identify IoT mechanisms
    - 4.How will you deploy the same.

Term Work:
Term Work shall consist of at least 8 experiments/assignments based on the syllabus above. Assessment
of term work should be done as follows
- Continuous lab assessment
- Actual practical performance in laboratory
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FACULTY OF ENGINEERING AND TECHNOLOGY
Final Year Engineering (CSE)
Part-I

Course Code: CSE427  Title: Project Part-I
Teaching Scheme:  Examination Scheme:
Practical: 04 Hours/Week  Term Work: 25 Marks

1. Project Group size should be of maximum 4 students.
2. The project is to be taken up at the start of the semester I and the project must be completed by the end
   of semester II.
3. While submitting project proposal care is to be taken that project will be completed within the available
   time of two terms.
4. Project title should be precise and clear. Selection and approval of topic: Topic should be related to real
   life or commercial application in the field of Information Technology.
   OR
   Investigation of the latest development in a specific field of Information Technology.
   OR
   Commercial and Interdisciplinary projects should be encouraged. The examination will be conducted
   independently in respective departments.
5. The group should maintain a logbook of activities. It should have entries related to the work done,
   problems faced, solution evolved etc., duly signed by guide. This data should be used for finding the
   total man hours and estimating the cost of the project.
6. The group is expected to complete details Literature Survey, system/problem definition, analysis,
   design, etc. in (B.E. first Term) seventh term, as a part of term work in the form of a joint report.
   Project report must be submitted in the prescribed format only. No variation in the format will be
   accepted.
7. The guides should regularly monitor the progress of the project work.
8. Assessment of the project for award of term work marks shall be done by the guide and a departmental
   committee as per the guidelines given in the following table.
9. The suggestive format of the report is as follows:
   (Only one report should be submitted per group as a part of term work submission.)

Title of the Project:
Names & Roll Numbers of the students:
Name of the guide:
Chapter 1: Introduction
Chapter 2: Literature Survey
Chapter 3: System Development
A) Assessment of project – I Term Work B.E. First Term

Name of the Project: ____________________________________________
Name of the Guide: ____________________________________________

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Exam Seat No.</th>
<th>Name of the Student</th>
<th>Assessment by Guide (70 %)</th>
<th>Assessment by Departmental Committee (30 %)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Literature Survey</td>
<td>Topic Selection</td>
</tr>
<tr>
<td>Marks</td>
<td>05</td>
<td></td>
<td>2.5</td>
<td>7.5</td>
</tr>
</tbody>
</table>

Sign of Guide                     Sign of Committee Members                     Sign of HOD
Dr. BABASAHEB AMBEDKAR MARATHWADA UNIVERSITY, AURANGABAD
FACULTY OF ENGINEERING AND TECHNOLOGY
Final Year Engineering (CSE)
Part-I

Course Code: CSE428  
Title: Seminar
Practical: 04 Hours/Week

Examination Scheme:
Term Work: 25 Marks

All the final year students are informed to present a seminar on a topic related to current trends and technologies. Seminar should be evaluated on the following basis:

- PPT prepared and Presentation skills
- Understanding of subject
- Report preparation
Course Code: CSE451    Title: Big Data Computing
Teaching Scheme: Theory: 4 Hours/Week
Examination Scheme: Class Test: 20 Marks
Theory Examination (Marks): 80 Marks
Theory Examination (Duration): 03 Hours

Prerequisite:
1. Students should have the knowledge of programming language (Python, Java), Database Management Systems, Linux Operating Systems and Data warehousing & Data Mining.

Objectives:
1. To know the fundamental concepts of big data and analytics.
2. To understand technical and business professionals who need to understand the different types of big data components and the underlying technology concepts that support big data.
3. To understand concepts of Hadoop, Map Reduce, Hadoop file systems (HDFS).
4. To explore tools and practices for working with big data.
5. To know about the research that requires the integration of large amounts of data

CONTENTS
SECTION-A

Unit 1: Statistics Essential for Analytics [06 Hrs]

Unit 2: Data Extraction, Wrangling and Exploration [08 Hrs]
What is Data? Types of Data: Quantitative & Qualitative Data, What is a Variable? Sampling Methods, Point Estimation, Hypothesis Testing, Parametric Testing, Non-Parametric Testing, Experimental designing, Data Analysis Pipeline, What is Data Extraction, Raw and Processed Data, Data Wrangling, Exploratory Data Analysis, Visualization of Data: Strip Charts, Histogram, Box Plots, Scatter Plots, Case Study- Stock Market predictions.

Unit 3: Fundamentals of Big Data [06 Hrs]
What is Big data? Characteristics of big data and its role in current world, Types of Big Data: Defining Unstructured, Semi-Structure and Structured Data, Technologies being Used to handle and process Big data, Five V’s of big data, Drivers for big data, Big data challenges, Fallbacks of traditional RDBMS in handling and processing Big data, Some Real-world Examples to adopt in major industries, NoSQL Databases, CAP Theorem Categories of NoSQL: Key Value Stores, Document Stores, Column Oriented Stores, Graph Databases.
SECTION-B

Unit 4: Introduction to Hadoop (Understanding Hadoop Ecosystem) [06Hrs]
What is Hadoop? Hadoop Key Characteristics, Differences between RDBMS & Hadoop, Brief History of Hadoop, Hadoop Ecosystem (Version 1.x & 2.x), Hadoop commands, Components of Hadoop (Version 2.x): HDFS & MapReduce, Architecture of HDFS & Map Reduce, Basic Operations to store and access from HDFS via Command Line, Phases in MapReduce Algorithm, YARN architecture, YARN advantages.

Unit 5: Pig & Hive Hadoop Projects [08 Hrs]
Apache Pig: Pig Architecture, Modes of Pig Execution, Operations in Pig: Intro to Pig Latin, Pig Latin Data types, Basic Pig Latin Statements: Loading and Storing Data, Relational and Arithmetic Operators, Debugging Techniques (Dump, Describe, Explain etc.).
Apache Hive: Hive architecture, Modes of Hive Execution, Operations in Hive: Intro toHiveQL, Basic HiveQL commands: DDL Operations (creating, browsing, updating and deleting tables), DML Operations (Load, Update, Insert and delete data into Hive tables).

Unit 6: HBase & Sqoop Hadoop Projects [06 Hrs]
Apache HBase: HBase Architecture, HBase Vs RDBMS, HBase Shell Commands.
Apache Sqoop: Sqoop Architecture, importing data: Transferring an entire table, specifying a target directory, importing only a subset of data, Incremental Uploads: Importing only new data.

Text Books:

Reference Books:
4. “Apache Sqoop Cookbook” Kathleen Ting, JarekJarceCecho, O’Reilly Publication.

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4. From the remaining questions in section A and B students are supposed to solve any two questions, 15 marks each.
Course Code: CSE452 Title: Soft Computing

Teaching Scheme: Theory: 4 Hours/Week  Class Test: 20 Marks

Examination Scheme: Theory Examination (Marks): 80 Marks
Theory Examination (Duration): 03 Hours

Prerequisite:
1. Programming Languages (C, C++, Java, MatLab)
2. Basic Mathematics

Objectives:
1. To understand the scope of soft computing and pattern recognition tasks that can be
   performed by some of the basic structures of artificial neural networks.
2. Analyze feed forward networks and understand the significance of nonlinear output
   functions of processing unit in feedback network for pattern storage.
3. To understand basics of deep learning
4. To describe and explain Core concepts and techniques of fuzzy logic.
5. To understand the working of Genetic Algorithm and synthesize applications of soft
   computing using Genetic Algorithm.

CONTENTS
SECTION-A

Unit 1: Soft Computing: [7 Hrs]
Introduction of soft computing, soft computing vs. hard computing, various types of soft computing
techniques, applications of soft computing. Characteristics of Neural Networks, Structure and Working of
a biological neural network, Artificial Neural Network Terminology, models of neurons: MP model,
Perceptron model, Adaline model, Topology, Basic Learning laws, what is learning, supervised and
unsupervised learning, Functional Units of ANN for pattern recognition task: Pattern Recognition
Problem, Basic functional units.

Unit 2: Perceptron learning [7 Hrs]
Single layer and multilayer perceptron, linear and non-linear separability problems, supervised learning
algorithms, Error correction and Gradient Decent Rules, FFNN, Architecture of FFNN, Backpropagation
learning algorithm, pattern classification, pattern association by FFNN.

Unit 3: Pattern association [6 Hrs]
Auto association and hetero association, feedback NN, architecture of FBNN, energy function, associative
memory, bidirectional associative memory, Hopfield network.
SECTION-B

Unit 4: Deep Learning [7 Hrs]
Introduction to deep learning, why deep learning? Building blocks of deep neural network, Introduction to RNN, CNN with an example.

Unit 5: Fuzzy Logic [6 Hrs]
Classical sets, Fuzzy sets, Crisp relations, Fuzzy relations, Examples, Properties of membership functions, fuzzification and Defuzzification to crisp sets, Application of fuzzy control.

Unit 6: Genetic Algorithms and its applications [7 Hrs]
Fundamentals, basic concepts, working principle, Inheritance Operators, Cross over types, inversion and Deletion, Mutation Operator, Bit-wise Operators, Convergence of GA, Applications of GA.

Text Books:
2. B. Yegnanarayana, “Artificial Neural Networks”, PHI Publications.

Reference Books:

PATTERN OF QUESTION PAPER:
Six units in the syllabus shall be divided in two equal parts i.e. 3 units in each part. Question paper shall be set having two sections A and B. Section A questions shall be set on first part and Section B questions on second part. Question paper should cover the entire syllabus.

For 80 marks Paper:
1. Minimum ten questions
2. Five questions in each section
3. Question no. 1 from section A and Question no. 6 from section B, 10 marks each, will be compulsory.
4. From the remaining questions in section A and B students are supposed to solve any two questions, 15 marks each.
Course Code: CSE453     Title: Machine Learning
Teaching Scheme: Examination Scheme:
Theory: 04 Hours/Week                                                Class Test: 20 Marks
Theory Examination (Marks): 80 Marks
Theory Examination (Duration): 03 Hours

Prerequisite:
1. Probability
2. Linear Algebra
3. Basics of Programming

Objectives:
1. To understand the possibilities and limitations of ML, and know how to formulate your own ML problem.
2. To understand the main ideas behind the most widely used machine learning algorithms
3. To know how to build predictive models from data and analyze their performance.

CONTENTS

SECTION-A

UNIT 1: Introduction[6 Hrs]
What Is Machine Learning? Examples of Machine Learning Applications, Learning Associations, Classification, Regression, Unsupervised Learning, Reinforcement Learning

UNIT 2: Supervised Learning[08 Hrs]
Learning a Class from Examples, Vapnik-Chervonenkis (VC) Dimension, Probably Approximately Correct (PAC) Learning, Noise, Learning Multiple Classes, Regression, Model Selection and Generalization, Dimensions of a Supervised Machine Learning Algorithm

UNIT 3: Dimensionality Reduction [06 Hrs]
Introduction, Subset Selection, Principal Components Analysis, Factor Analysis, Multidimensional Scaling, Linear Discriminant Analysis, Isomap, Locally Linear Embedding

SECTION-B

UNIT 4: Decision Tree Learning [06 Hrs]
Introduction, Decision tree presentation, Appropriate problems for Decision tree learning, The Basic decision tree learning algorithm, Which attribute is the best classifier?, An Illustrative example.

UNIT 5: Clustering [08 Hrs]
Introduction, mixture Densities, k-Means Clustering, Expectation-Maximization Algorithm, Mixtures of Latent Variable Models, Supervised Learning after Clustering, Hierarchical Clustering, Choosing the Number of Clusters

UNIT 6: Bayesian Decision Theory [06 Hrs]
Introduction, Classification, Losses and Risks, Discriminant Functions, Utility Theory, Association Rules
**Text Books:**
2. Introduction to Machine Learning Edition 2, by EthemAlpaydin

**Reference Books:**

**PATTERN OF QUESTION PAPER:**
Six units in the syllabus shall be divided in two equal parts i.e. 3 units in each part. Question paper shall be set having two sections A and B. Section A questions shall be set on first part and Section B questions on second part. Question paper should cover the entire syllabus.

**For 80 marks Paper:**
1. Minimum ten questions
2. Five questions in each section
3. Question no. 1 from section A and Question no.6 from section B, 10 marks each, will be compulsory.
4. From the remaining questions in section A and B students are supposed to solve any two questions, 15 marks each.
Course Code: CSE491
Title: (Elective – V) Information & Cyber Security

Teaching Scheme:
Theory: 04 Hours/Week

Examination Scheme:
Class Test: 20 Marks
Theory Examination (Marks): 80 Marks
Theory Examination (Duration): 03 Hours

Prerequisite:
1. Data Communication
2. Computer Network
3. Network Security

Objectives:
1. Understand information and network security.
2. To study assessment types for information security
3. To study cyber security fundamentals.
4. To study different cybercrimes.
5. To learn forensics and investigation tools and techniques.

CONTENTS

SECTION-A

Unit 1: Introduction to Information Security [08 Hrs]

Unit 2: Implementing Information Security [06 Hrs]

Unit 3: Information Security Maintenance [06 Hrs]

SECTION-B

Unit 4: Introduction to Cyber Security [06 Hrs]
Introduction, Definition and origin, Cybercrime and Information security, Classification of cybercrimes, The legal perspectives- Indian perspective, Global perspective, Categories of Cybercrime, Types of Attacks, a Social Engineering, Cyber stalking, Cloud Computing and Cybercrime.

Unit 5: Cybercrime: Mobile and Wireless Devices [06 Hrs]

Unit 6: Tools and Methods Used in Cybercrime [08 Hrs]
Introduction, Proxy servers and Anonymizers, Phishing, Password Cracking, Key-loggers and Spywares, Types of Virus, Worms, Dos and DDoS, SQL injection, Cybercrime and Legal perspectives, Cyber laws- Indian context, The Indian IT Act-Challenges, Amendments, Challenges to Indian Law and cybercrime Scenario in India, Indian IT Act and Digital Signatures. Study network security scanners: Nmap and Wireshark.

Text Books:

Reference Books:


Pattern of Question Paper:
Six units in the syllabus shall be divided in two equal parts i.e. 3 units in each part. Question paper shall be set having two sections A and B. Section A questions shall be set on first part and Section B questions on second part. Question paper should cover the entire syllabus.

For 80 marks Paper:
1. Minimum ten questions
2. Five questions in each section
3. Question no. 1 from section A and Question no. 6 from section B, 10 marks each, will be compulsory.
4. From the remaining questions in section A and B students are supposed to solve any two questions, 15 marks each.
Course Code: CSE492
Title: (Elective – V) Enterprise Resource Planning

Teaching Scheme
Theory:04 Hours/Week

Examination Scheme
Class Test: 20 Marks
Theory Examination (Marks): 80 Marks
Theory Examination (Duration): 03 Hours

Prerequisite:

Objectives:
The learner will be familiar with ERP and related technologies like Business Processing Reengineering (BPR), Supply Chain Management (SCM), Customer Relationship Management (CRM), MIS - Management Information System, DSS - Decision Support System, EIS - Executive Information System etc. The learner should gain the knowledge on ERP tools and ERP benefits.

CONTENTS

SECTION-A

Unit 1: Introduction to ERP [7 Hrs.]
Enterprise – An Overview, integrated Management Information, Business Modeling, and Integrated Data Model
ERP and Related Technologies: Business Processing Reengineering (BPR), Data Warehousing, Data Mining, On-line Analytical Processing (OLAP), Supply Chain Management (SCM), Customer Relationship Management (CRM), MIS - Management Information System, DSS - Decision Support

Unit 2: ERP Manufacturing Perspective [07 Hrs.]
ERP Modules: Finance, Plant Maintenance, Quality Management, Materials Management

Unit 3: ERP Implementation Lifecycle [06 Hrs.]
Pre-evaluation Screening, Package Evaluation, Project Planning Phase, Gap Analysis, Reengineering, Configuration, Implementation Team Training, Testing, Going Live, End-user Training, Post-implementation (Maintenance mode)

SECTION-B

Unit 4: E-Business Architecture [06 Hrs.]
Enterprise resource planning the E-business Backbone Enterprise architecture, planning, ERP usage in Real world, ERP Implementation, E-Procurement, E-Governance, Developing the E-Business Design

Unit 5: Introduction to ERP tools [07 Hrs.]

Unit 6: ERP Market, ERP Present and Future [07 Hrs.]
ERP Vendors: - SAP, BAAN, Oracle, PeopleSoft, Microsoft dynamics, ERP and Total Quality Management, ERP Subsystems: Human Resource Management (HRM), Inventory Control System, Quality Management, Marketing

Text Books
2. Enterprise Resource Planning – Diversified by Alexis Leon, TMH.

Reference Books:
3. E-Business Network Resource planning using SAP

PATTERN OF QUESTION PAPER:
Six units in the syllabus shall be divided in two equal parts i.e. 3 units in each part. Question paper shall be set having two sections A and B. Section A questions shall be set on first part and Section B questions on second part. Question paper should cover the entire syllabus.

For 80 marks Paper:
1. Minimum ten questions
2. Five questions in each section
3. Question no. 1 from section A and Question no. 6 from section B, 10 marks each, will be compulsory.
4. from the remaining questions in section A and B students are supposed to solve any two questions, 15 marks each.
Course Code: CSE493  
Title: Elective-V Game Architecture & Design  
Teaching Scheme:  
Theory: 4 Hours/Week  
Examination Scheme:  
Class Test: 20 Marks  
Theory Examination (Marks): 80 Marks  
Theory Examination (Duration): 03 Hours

Prerequisite:
1. Basic visual design and basic scripting or programming skills  
2. Moderate fluency in 2D and 3D animation and graphics packages  
3. Awareness of game platforms and the technology

Objectives:
1. To familiarize with the process of game design and development  
2. To learn the processes, mechanics, issues in game design  
3. To understand the architecture of game programming

CONTENTS
SECTION-A

Unit 1: Games and Video Games  
Introduction, Conventional Games Versus Video Games, Games for Entertainment, Serious Games, 
Designing and Developing Games: Key Components of Video Games, The Structure of a Video Game, 
Stages of the Design Process, Game Design Team Roles, Game Design Documents, The Anatomy of a 
Game Designer, The Major Genres, Understanding Your Player, Understanding Your Machine, Game Balance.

Unit 2: Game Concepts  
Getting an Idea, From Idea to Game Concept, Game Worlds, Creative and Expressive Play, 
Character Development, The Goals of Character Design: The Relationship Between Player and Avatar, 
Visual Appearances, Character Depth, Audio Design

Unit 3: Storytelling and Creating the User Experience  
Key Concepts, The Storytelling Engine, Linear and Nonlinear Stories, Granularity, 
SECTION-B

Unit 4: Current Methods of Team Management       [6 Hrs]

Unit 5: Architecture Design       [8 Hrs]

Unit 6: Game Analysis       [6 Hrs]
Game Analysis: Abdicating Authorship, Familiar Subject Matter, Safe Experimentation, Depth and Focus, Interface, Controlled Versus Autonomous Behavior, A Lesson to Be Learned. Designing Design Tools., Desired Functionality, Scripting Languages and Object Behaviors, Us Versus Them, The Best of Intentions, A Game Editor for All Seasons, Play testing.

Text Books:
2. Game Architecture and Design by Andrew Rollings Dave Morris

Reference Books:
1. Game Design: Theory & Practice by Richard Rouse III Illustrations by Steve Ogden, Foreword by Noah Falstein
2. The Art of Game Design by Jesse Schell, Morgan Kaufmann Publication
3. Game Programming Patterns by Robert Nystorm

Pattern of Question Paper:
Six units in the syllabus shall be divided in two equal parts i.e. 3 units in each part. Question paper shall be set having two sections A and B. Section A questions shall be set on first part and Section B questions on second part. Question paper should cover the entire syllabus.

For 80 marks Paper:
1. Minimum ten questions
2. Five questions in each section
3. Question no. 1 from section A and Question no. 6 from section B, 10 marks each, will be compulsory.
4. From the remaining questions in section A and B students are supposed to solve any two questions, 15 marks each.
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FACULTY OF SCIENCE AND TECHNOLOGY
Final Year Engineering (CSE)
Part-II

Course Code: CSE494
Title: Elective-V Human Computer Interface
Teaching Scheme:                        Examination Scheme:
Theory: 4 Hours/Week                  Class Test: 20 Marks
                                                  Theory Examination (Marks): 80 Marks
                                                  Theory Examination (Duration): 03 Hours

Prerequisite:
1. GUI & basics
2. HTML & CSS
3. Basics of system design and programming

Objectives:
1. To learn capabilities of humans & computers from point of view of human information processing.
2. To learn HCI design principles, standards & guidelines.
3. To learn & analyze user models, socio-organizational issues & stakeholder requirements of HCI systems.
4. To analyze & discuss HCI issues in multimedia & World Wide Web related environment.

CONTENTS
SECTION-A

Unit 1: Introduction [08 Hrs]
The human, the computer, The interaction, Paradigms, Usability of Interactive Systems, Guidelines, Principles, and Theories.

Unit 2: Design Process [06 Hrs]
Interaction design basics, HCI in the software process, Design rules, managing design process

Unit 3: Implementation and Evaluation [06 Hrs]
Implementation support, Evaluation techniques, Universal design, User support, evaluating user interface design.

SECTION-B

Unit 4: Models [08 Hrs]
Cognitive models, Socio-organizational issues and stakeholder requirements, Communication and collaboration models.

Unit 5: Theories [06 Hrs]
Task analysis, Dialogue notations and design, Models of the system, modeling rich interaction.

Unit 6: Outside the Box [06 Hrs]
Group ware, Ubiquitous computing and augmented realities,

**Text Books:**

**Pattern Of Question Paper:**
Six units in the syllabus shall be divided in two equal parts i.e. 3 units in each part. Question paper shall be set having two sections A and B. Section A questions shall be set on first part and Section B questions on second part. Question paper should cover the entire syllabus.

**For 80 marks Paper:**
1. Minimum ten questions
2. Five questions in each section
3. Question no. 1 from section A and Question no. 6 from section B, 10 marks each, will be compulsory.
4. From the remaining questions in section A and B students are supposed to solve any two questions, 15 marks each.
Course Code: CSE471  
Title: LAB-V Big Data Computing

Teaching Scheme:
Practical: 2 Hours/Week

Examination Scheme:
Practical /Oral Examination: 50 Marks
Practical /Oral Examination (Duration): 03 Hours

Prerequisites:
Familiarity with intermediate Python or Java is advised. Most assignments could easily be done in Python, Scala, Java or R.

Instructions:
Students need access to a computer with 64 bit operating system and at least 4 GB of RAM.
Note: 8 GB or more RAM is strongly advised.

Suggestive List of Practical Assignments:
Design, develop and implement the following Assignments-

1. Import the following data into some statistical tool (R/SAS) and calculate the mean, median, mode and standard deviation

<table>
<thead>
<tr>
<th>Rural Male</th>
<th>Rural Female</th>
<th>Urban Male</th>
<th>Urban Female</th>
</tr>
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<tr>
<td>50-54 11.7</td>
<td>50-54 8.7</td>
<td>50-54 15.4</td>
<td>50-54 8.4</td>
</tr>
<tr>
<td>55-59 18.1</td>
<td>55-59 11.7</td>
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<td>55-59 13.6</td>
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<tr>
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<tr>
<td>65-69 41.0</td>
<td>65-69 30.9</td>
<td>65-69 54.6</td>
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<tr>
<td>70-74 66.0</td>
<td>70-74 54.3</td>
<td>70-74 71.1</td>
<td>70-74 50.0</td>
</tr>
</tbody>
</table>

2. Perform Data wrangling, clean the data, Analyze and Visualize using appropriate type of graph on Some Dataset with some statistical tool (R/SAS).
5. Write a Map Reduce program to count words from a given text file.
7. Perform a NOSQL analysis of a public data set using HIVE Scripting.
8. Import data from a SQL database to HDFS using Sqoop.
9. Case study: Hadoop and Hive at Facebook.
10. Case study: Study & Installation of Cloudera CDH

Practical Examination: Practical Examination should be conducted by internal examiner for three hours under the supervision of external examiner. External examiner should evaluate student by checking practical performance and conducting viva.
Course Code: CSE472
Title: LAB VI - Soft Computing
Teaching Scheme:
Practical: 2 Hours/Week
Examination Scheme:
Practical /Oral Examination: 50 Marks
Practical /Oral Examination (Duration): 03 Hours

Suggestive List of Practical Assignments:
Minimum 08 implementation assignments and two study assignments should be conducted.

1. Write a program to implement MP-model
2. Write a program for solving linearly separable and nonlinearly separable problems with single layer and multilayer perception.
3. Write a program to solve pattern recognition problem with FFNN using back propagation algorithm.
4. Write a program to solve pattern storage problem with feedback NN
5. Write a program for deep learning (RNN/CNN).
6. Write a program to solve Face recognition problem using ANN as a classifier
7. Write a program to solve character recognition problem (or classification for medical database)
8. Write a program to implement Fuzzy set operation and properties.
9. Write a program to perform Max-Min composition of two matrices obtained from Cartesian Product.
10. Implementation of Simple Genetic Application

Practical Examination:
Practical Examination should be conducted by internal examiner for three hours under the supervision of external examiner. External examiner should evaluate student by checking practical performance and conducting viva.
Design, develop and implement the following Assignments (Minimum 8)

Suggestive List of Practical Assignments:

1. Introduction to Python.
2. Implementation of Simple Linear Regression.
3. Implementation of Multivariate Linear Regression.
5. Implementation of Multivariate Logistic Regression.
8. Principal Components Analysis.
9. Study of Natural Language Toolkit (NLTK) a suite of libraries.

Practical Examination: Practical Examination should be conducted by internal examiner for three hours under the supervision of external examiner. External examiner should evaluate student by checking practical performance and conducting viva.
Course Code: CSE474 Title: LAB-VIII (Elective – V) Information & Cyber Security

Teaching Scheme:
Practical: 02 Hours/Week

Examination Scheme:
Term Work: 50 Marks

Suggestive List of Practical Assignments:
Minimum 8 Assignments should be conducted

Design, develop and implement the following Assignments

1. Installation and demonstration of Nmap/Wireshark/any other security scanning tool.
2. Perform an experiment to demonstrate Nmap/ Wireshark/ any other security scanning tool.
3. Install & perform penetration testing using Metasploit tool.
4. Write a program in C++ or Java to implement RSA algorithm for key generation and cipher verification.
5. Install & perform an experiment using Samurai tool.
6. Write a java code to create antivirus & detect the virus.exe file.
8. Install & perform Aircrack-ng for wireless password hacking.
9. Install & perform operations on Maltego tool.
10. Install & perform an experiment using HULK: DoS attack tool for the web server.
11. Visit Cyber Cell Forensic Lab & write a report of visit
12. Study of IT ACT 2000 & 2008 (Information Technology Amendment)
13. Case Study: Cyber Crime

Term Work:
The Term Work shall consist of at least 8 experiments / assignments based on the suggestive list of practical assignments. Assessment of term work should be done as follows:

- Continuous lab assessment
- Actual practical performance in laboratory
Course Code: CSE475
Teaching Scheme
Practical: 2 Hours/Week

Title: Lab VIII Elective-V-ERP
Examination Scheme:
Term Work: 50 Marks

List of Practical Assignments:
All Experiment are compulsory.

1. To study the basics of ERP system.
2. Study of ERP technologies and its ecosystem.
5. Study of different ERP modules.
6. Study of ERP implementation life cycle.
7. Study of open source ERP systems.
8. Case study on Integrated Enterprise applications.
9. Case study: SAP.
10. Case study: Microsoft Dynamics.

Note: Instructor may modify the list of assignments if required and can add more assignments if required

Term Work: The term work shall consist of at least 8 experiments/ assignments based on the syllabus above. Assessment of term work should be done as follows
1. Continuous lab assessment
2. Actual practical performance in Laboratory.
Course Code: CSE476                Title: LAB VIII Elective-V- Game Architecture and Design
Teaching Scheme:                                                                      Examination Scheme: 
Practical: 2 Hours/Week                                                         Term Work: 50 Marks

Suggestive List of Practical Assignments:

Design, develop and implement the following Assignments using Python programming

1. Introduction to python programming
2. Write an assignment on designing and developing games
3. Create your own story in graphics tool
4. Write an assignment on solving game development issues.
5. Write a program for sliding puzzle game
6. Write a program for nibbles game
7. Write a program for tic-tac-toe game
8. Write a program for connect four game
9. Write a program for abalone game
10. Write a program for Simon game
11. Write a program for memory puzzle game
12. Write an assignment on game analysis and play testing

Term Work: The term work shall consist of at least 8 experiments/ assignments based on the syllabus above. Assessment of term work should be done as follows
1. Continuous lab assessment
2. Actual practical performance in Laboratory.
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FACULTY OF SCIENCE AND TECHNOLOGY  
Final Year Engineering (CSE)  

Part-II  

Course Code: CSE477  
Title: LAB VIII Elective-V- Human Computer Interface  
Teaching Scheme:  
Practical: 2 Hours/Week  
Examination Scheme:  
Term Work: 50Marks  

Suggestive List of Practical Assignments:  

Design, develop and implement the following Assignments.  

1. Create a webpage with HTML describing your department. Use paragraph and list tags. Apply various colors to suitably distinguish key words. Also apply font styling like italics, underline and two other fonts to words you find appropriate. Also use header tags.  

2. Create a webpage with HTML to illustrate the use of embedded multimedia.  

3. Design a Signup form with validation using HTML.  

4. Write a program to create menu using HTML & CSS. Apply CSS to change colors of certain text portion, bold, underline and italics certain words in your HTML web page. Also change background color of each paragraph using CSS.  

5. Write a program to Show use of alert, confirm and prompt box as an interaction for user & computer.  

6. Write a program to show the webpage layout with <div> tags using HTML & CSS.  

7. Create a responsive webpage for your college website using HTML, CSS & Bootstrap.  

8. Case Study based on above syllabus.  

Term Work:  

The term work shall consist of at least 8 experiments/ assignments based on the syllabus above. Assessment of term work should be done as follows:  

1. Continuous lab assessment  
2. Actual practical performance in Laboratory.
1. The guide should be internal examiner for oral examination.
2. The external examiner should be from the related area of the concerned project. He should have minimum of five years of experience at degree level / industry.
3. The evaluations at final oral examination should be done jointly by the internal and external examiner.
4. The same project group of Part I should continue the work in Part – II as well. The project group should complete the project work taken in Part I. It should complete the rest of the work from stage III onwards till the conclusion. The performance Analysis chapter should consist of various testing methods used along with sample test cases. It should also include how better the system is performing as compared to other similar systems. The final examination will consist of the demonstration of work which will be judged by two examiners (one internal and one external) and the marks will be given accordingly. The suggestive format of the report is as follows:
(Only one report should be submitted per group as a part of term work submission)

Title of the Project:

Names & Roll Numbers of the students:

Name of the guide:

Chapter 1: Introduction

Chapter 2: Literature Survey

Chapter 3: System Development
(This chapter will include the entire design process with necessary DFDs, other diagrams, design methodologies and other design and implementation details.)

Chapter 4: Performance Analysis
Chapter 5: Conclusions

(Detailed format of the project report is to be made available by the Dept.)