T. Y. B. Tech. Computer Engineering Semester – II

Course Code	Course Title	Teaching Scheme Hours /Week			Examination Scheme				Marks	Credit
		Lecture	Tutorial	Practical	In Semester	End Semester	Oral	Practical		
CE 3201	Theory of Computation	3	1	0	50	50	0	0	100	4
CE 3202	Artificial Intelligence and Machine Learning	3	0	0	50	50	0	0	100	3
CE 3203	Software Design and Architecture	3	1	0	50	50	0	0	100	4
PECE 3201	Programme Elective-II	3	0	0	50	50	0	0	100	3
PECE 3202	Programme Elective-III	3	0	0	50	50	0	0	100	3
CE 3204	Seminar	0	0	4	25	0	25	0	50	2
CE 3205	Artificial Intelligence and Machine Learning Laboratory	0	0	4	0	0	0	50	50	2
PECE 3203	Programme Elective-III Laboratory	0	0	2	0	0	25	0	25	1
AC 3201	Audit Course	0	0	2	0	0	0	0	0	0
	Total	**15**	**2**	**12**	**275**	**250**	**50**	**50**	**625**	**22**
	Grand Total	**29**			**625**				**625**	**22**

PECE 3201: Programme Elective-II

1. Wireless and Mobile Communication
2. Software Testing and Quality Assurance
3. Human Computer Interaction
4. Multimedia Systems
5. Swayam Online Course

PECE 3202: Programme Elective-III
PECE 3203: Programme Elective-III Laboratory

1. Data Mining and Data Warehousing
2. Embedded and Real-Time Systems
3. Linux Internals
4. Image Processing

AC 3201 -- Audit Course: Employability Skills Development

M.K.S.S.S. Cummins college of Engg. for Women ★
KARVENAGAR
Pune -52

DEAN ACADEMICS
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Karvenagar, Pune-411052

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APPROVED BY
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MKSSS's Cummins College
of Engineering for Women
Karvenagar, Pune-411052

CE 3201 THEORY OF COMPUTATION

Teaching Scheme	**Examination Scheme**
Lectures: 03 Hrs/Week	In Semester: 50 marks
Tutorial : 01 Hrs/Week	End Semester: 50 Marks
	Credits: 4

Prerequisites:

1. Data Structures and Algorithms II (CE 2201)
2. Discrete Mathematics (CE 2103)

Course Objectives:

To facilitate the learners -

1. Recall and understand the basics of mathematical concepts, formal languages and machines.
2. Understand and design different computational models like finite automata, regular expression, push down automata, context free grammar, turing machine for a given language.
3. Apply inter conversion between equivalent representations of a language.
4. Learn classification of a given problem into appropriate complexity class.

Course Outcomes:

By taking this course, the learner will be able to -

1. Make use of fundamentals of mathematical concepts, formal languages and automata theory.
2. Construct different computation models like finite automata, regular expression, push down automata, context free grammar, turing machine for a given language.
3. Evaluate capabilities of Computational model by inter-conversion.
4. Classify a problem into appropriate complexity class.

Unit 1: Introduction (06)

Finite and infinite set. Basic concepts of symbol, alphabet, string. Formal Language Definition, Problems. Finite representation of languages. Concept of Basic Machine and Finite State Machine introduction.

Regular Expression (RE): definition and operators, Regular Set, Algebraic Laws of Regular Expressions, Closure Properties of Regular Languages, Regular expression examples.

Unit 2: Finite Automata (08)

Finite Automata (FA) - (Deterministic FA, Non-deterministic FA, Є-NFA): Definition , Transition Function and language acceptance, Transition graph, Construction of FA.

Conversion of NFA with Є moves to NFA without Є moves, Conversion of NFA without Є moves to DFA, Direct Conversion of NFA with Є to DFA, Inter-conversion of RE and FA, Construction of RE equivalent to FA using Arden’s Theorem. Construction of FA equivalent to RE (RE to Є-NFA, Є-NFA to DFA). Pumping Lemma for Regular languages, Limitations of FA.

Unit 3: Context Free Grammar (07)

Grammar- Definition, representation of grammar. Context Free Grammar (CFG) - Definition, Derivation – Leftmost, Rightmost, sentential form, parse tree, ambiguous grammar and removing ambiguity from grammar, Simplification of CFG, Normal Forms - Chomsky normal form, Greibach normal form, Closure properties of Context Free Languages (CFL), Decision properties of CFL, Chomsky hierarchy. Regular grammar- Definition, left linear, right linear grammar, Applications of grammar.

Unit 4: Push Down Automata (07)

Definition, Notations – Transition Table form, Types of PDA (Deterministic PDA and Non Deterministic PDA), acceptance by final state, acceptance by empty stack, Construction of PDA (DPDA, NPDA), Instantaneous Description of PDA. Equivalence of PDA and CFG - Grammar to PDA conversion, Applications of PDA.

Unit 5: Turing Machine (07)

Turing machines (TMs) - Formal Definition, TM Instantaneous Description, Transition Function, Languages of TM, Turing Machine and halting, Deterministic Turing Machines (DTM) , Construction of DTM. Universal Turing Machine (UTM), Church -Turing hypothesis, Comparison between FA, PDA and TM. Turing Machine Halting Problem.

Unit 6: Introduction to Undecidability (07)

A Language that is not recursively enumerable, Enumerating the binary strings, diagonalization Language, An undecidable problem that is RE, Recursive language, Complements of Recursive and RE languages, universal language, Undecidability of the universal language, classes P, NP and NP-Complete Problem

Text Books:

1. Hopcroft J., Motwani R., Ullman J., "Introduction to Automata Theory, Languages and Computations", Third edition, 2008, Pearson Education Asia. ISBN: 9788131720479
2. John C Martin. "Introduction to Language and Theory of Computation", Third edition, 2012, Tata McGraw- Hill, ISBN: 978007660489

Reference Books:

1. Daniel Cohen., “Introduction to Computer Theory”, Second edition, 2011, Wiley Publications (India) ISBN: 9788126513345
2. H.R. Lewis, C. H. Papadimitrou, ”Elements of the Theory of Computation”, Second edition, 2006, Prentice Hall Inc. ISBN: 8131703878
3. Michael Sipser, ”Introduction to The Theory of Computation”, Third edition, 2017 Thomson Course Technology, ISBN: 9781131525296
4. Vivek Kulkarni, “Theory of Computation”, Oxford university edition, 2013, ISBN 13:9780198084587

Web References:

1. NPTEL :: Computer Science and Engineering – Theory of Computation http://nptel.ac.in/courses/106101061

Example List of Tutorials:

1. Identify Complexity (n2, log n etc.)for a given code
2. Design of Regular Expression from Language
3. Design Deterministic Finite Automata
4. NFA design and NFA to DFA conversion
5. RE to NFA with null moves and NFA with null moves to NFA without null moves
6. Formal language to CFG and CFG to language conversion
7. Simplification of CFG and Chomsky Normal Form
8. Design of Push down Automata
9. Design of Turing Machine
10. Classification of a problem into appropriate complexity classes by reduction

CE 3202 Artificial Intelligence and Machine Learning

Teaching Scheme	Examination Scheme
Lectures: 3 Hr/Week	In Semester : 50 Marks
	End Semester : 50 Marks
	Credits : 3

Course Objectives:

To facilitate the learners to-

1. Learn overview of classic Artificial Intelligence and basics of machine learning.
2. Understand various intelligent searches and knowledge representation.
3. Understand types of learning as well as machine learning.
4. Study applications in Artificial Intelligence and Machine Learning.

Course Outcomes:

By taking this course, the learner will be able to –

1. Build fundamental knowledge of AI, its applications and solve classical AI problems using different AI Techniques
2. Apply intelligent search algorithms on AI problems.
3. Make use of Knowledge Management techniques of AI for reasoning.
4. Apply the appropriate supervised / unsupervised Machine Learning (ML) method to solve the given problem.
5. Examine different topics with various methods of expert system, pattern recognition, natural language processing, nature inspired computing.

Unit 1: Introduction to AI **(07)**

Definitions of Artificial Intelligence, Artificial Intelligence Problems, Topics of Artificial Intelligence: Learning Systems, Knowledge Representation and Reasoning, Planning, Knowledge Acquisition, Intelligent Search, Logic Programming, Soft Computing, Management of Imprecision and Uncertainty, Production Systems: Traveling Salesman Problem, Water-Jug Problem, State Space Representation, State Space Search, Tic-Tac-Toe as a State Space, Branches of Artificial Intelligence.

Unit 2: Heuristic Search Techniques **(07)**

Generate-and-Test, Search Techniques: Depth First Search, Breadth First Search, Best First Search Algorithm, Hill Climbing, Simulated Annealing, A* Algorithm, Problem Reduction, AND–OR Graphs, The AO* Algorithm, Towers of Hanoi Problem, Constraints Satisfaction: crypt-arithmetic problem, mini-max algorithm.

Unit 3: Knowledge Management **(07)**

Knowledge Management, Types of Knowledge: Declarative Knowledge, Procedural Knowledge, Knowledge Representation, Approaches to Knowledge Representation, Issues in Knowledge Representation, First-order Logic: Basic Predicate Representations, Conversion of WFF to Clause Form, Resolution, Unification, Resolution Examples, Reasoning, monotonic and non-monotonic reasoning.

Unit 4: Learning **(07)**

Types of Learning: Rote Learning, Learning by General Problem Solving, Concept Learning, Learning by Analogy, Learning problems and designing the learning systems, Machine Learning: Types of Problems in Machine Learning, Aspects of Inputs to Training, Learning Systems, Intelligent Agents.

Unit 5: Machine Learning methods and models **(07)**

Introduction to Supervised, Unsupervised, semi-supervised Learning, Ensemble Learning, discovery based Learning, Learning by problem solving, Reinforcement Learning, Support vector Machine, Artificial Neural Network : Perceptron, multi-layer perceptron, back propagation Neural Network, Self-organizing map.

Unit 6: Applications in Artificial Intelligence and Machine Learning **(07)**

Game Playing, Expert Systems, Natural Language Processing, Image Understanding & Computer Vision, Pattern Recognition, Virtual Reality, Nature Inspired Computing.

Text Books:

1. Vinod Chandra S. S., Anand Hareendran S., 'Artificial Intelligence and machine learning', PHI, (2014), ISBN 978-81-203-4934-6.
2. Kulkarni P., Joshi P., 'Artificial Intelligence: Building Intelligent Systems', PHI Learning, (2015), ISBN 978-81-203-5046-5.

Reference Books:

1. Peter, Norvig, 'Artificial Intelligence: A Modern Approach', Pearson, (3 rd edition), (2014), ISBN-0-13-103805-2.
2. Elaine Rich, Kevin Knight and Nair, 'Artificial Intelligence’, Tata McGraw – Hill, (3rd edition), (2012), ISBN-978-0-07-008770-5.
3. Bratko I., 'Prolog Programming for Artificial Intelligence', Pearson Education, (3rd edition), (2004).
4. Tom M. Michell, 'Machine Learning', McGraw Hill Education, Indian edition (2013), ISBN-13: 978-1-25-909695-2.
5. Ethem Alpaydin, 'Introduction to Machine Learning', PHI, (2006), ISBN-81-203-2791-8.

CE 3203 Software Design And Architecture

Teaching Scheme	**Examination Scheme**
Lectures: 3 Hrs/Week	In Semester: 50 marks
Tutorial: 1 Hr/Week	End Semester: 50 marks
	Credits: 4

Prerequisite: Data structures and Algorithms II (CE 2201)

Course Objectives:
To facilitate the learner to -

1. Develop familiarity with the basic concepts of software architecture and quality attributes of a system.
2. Model the software requirements of a system using Unified Modeling Language (UML) to understand the architectural, structural and behavioral aspects of the system.
3. Understand and apply various design patterns in creating an object oriented design.
4. Get exposure to the various software testing techniques and methods.

Course Outcomes:
By taking this course, the learner will be able to -

1. Analyze the concepts of software architecture and quality attributes to realize the solution of a system.
2. Build structural and behavioral models using Unified Modeling Language (UML).
3. Apply various design patterns to understand reusability in object oriented design.
4. Apply various software testing techniques at unit level, suitable to different problem areas.

Unit 1: Introduction to Software Architecture **(06)**

Software Development Life Cycle (SDLC), Software Requirement Specification (SRS), What is Software Architecture, Why Software Architecture is important.

Unit 2: Design Using Unified Modeling Language (UML) **(08)**

Importance of modeling, Use case Diagrams, Activity Diagrams, Class Diagrams, Sequence Diagrams.

Unit 3: Quality Attributes **(08)**

Understanding Quality Attributes, Quality Attribute Scenarios and Tactics - Performance, Security, Usability.

Unit 4: Creational and Structural Design Patterns (07)

What is Design Pattern, Classification of Design Patterns, Elements of Design Pattern, Creational Design Patterns - Singleton, Factory Method, Structural Design Patterns - Proxy, Adapter.

Unit 5: Behavioral Design Patterns (06)

Observer, Iterator, Model View Controller (MVC), Mediator.

Unit 6: Software Testing (07)

Introduction, Verification and Validation, White Box testing - Structural Testing – Unit / Code functional testing, Code coverage testing, Code complexity testing, Black Box testing - Equivalence Class Partitioning, Boundary Value Analysis.

Text books:

1. Len Bass, Paul Clements, Rick Kazman, **'Software Architecture in Practice'**, *Pearson Education,* (3rd Edition)(2013).
2. Grady Booch, James Rumbaugh, Ivar Jacobson, **'The Unified Modeling Language User Guide'**, *Pearson Education,* (2nd edition)(2008).
3. Erich Gamma, Richard Helm, Ralph Johnson and John Vlissides, '**Design Patterns-Elements of Reusable Object-Oriented Software',** *Pearson Education,* (2002).
4. Srinivasan Desikan, Gopalaswamy Ramesh, '**Software Testing Principles and Practices**', *Pearson Education,* ISBN 81-7758-121-X (2013).

Reference books:

1. Len Bass, Paul Clements, Rick Kazman, **'Software Architecture in Practice'**, *Pearson Education,* (2nd Edition) (2006).
2. Mary Shaw and David Garlan, **'Software Architecture – Perspectives on an Emerging Discipline'**, *Prentice Hall of India,* (1996).
3. Richard N. Taylor, Nenad M. and Eric M. Dashofy, **'Software Architecture: Foundations, Theory and Practice'**, *Wiley,* (2006).
4. Jim Arlow and Ila Neustadt, **'UML 2 and the Unified Process –Practical Object-Oriented Analysis and Design',** *Pearson Education,* (2nd edition) (2006).
5. Iien Burnstein, '**Practical Software Testing',** *Springer (India) private limited,* (2005).

Example List of Tutorials:

1. Study architectural styles and submit a report on these styles.
2. A case study of any website or any other large system and its architecture for quality attributes requirements such as Performance, Security, Usability and Availability.
3. Design a Software Requirement Specification (SRS) document for a given system.
4. Draw Use case diagrams for capturing and representing requirements of a given system.
5. Draw Activity diagrams to display the business flows for a given system.
6. Draw Class diagrams to identify and describe key concepts like classes, relationships and other classifiers like interfaces.
7. Draw Sequence diagrams to show message exchanges in a given system.
8. Identify suitable design patterns for a given application.
9. Apply various Black Box testing methods for unit testing of a sample application.
10. Apply various White Box testing methods for unit testing of a sample application.

CE 3204 SEMINAR

Teaching Scheme	**Examination Scheme**
Practical : 4 Hrs./week	In semester : 25 marks
	Oral : 25 marks
	Credits : 2

Course Objectives:

To facilitate the learners :-

1. To identify the topic based on current engineering trends/ social problems/ new technologies.
2. To explore the basic principles of communication (verbal and non verbal) and active, empathetic listening, speaking and writing techniques.
3. To produce relevant technical documents by following best practices of technical writing.
4. To understand the basic principles of presentation, technical writing techniques for seminar.

Course Outcome:

By taking this course, the learner will be able to :

1. Select appropriate/reserach topic and write a technical report and present it to audience.
2. Be familiar and use the basic technical writing concepts and terms such as audience analysis, jargon, format, visuals and presentation.
3. Improve skills to read, understand and interpret material on technology.
4. To enhance technical communication and presentation skills.

General Guidelines for Seminar:

- Seminar is an individual student activity.
- The area/domain must be selected under the guidance of institute guide.
- Each student will select a topic in the current/new trends of Computer Engineering and Technology beyond the scope of syllabus avoiding the repetition in consecutive years.
- Student should do - literature survey based on IEEE/ACM/Springer/Digital Library papers or technical Magazines/books, specify knowledge area, brief technical knowledge about the topic.
- Each student will make a seminar presentation based on the domain topic using audio/video aids for a duration of 20-25 minutes.
- Student have to submit the technical seminar report in the department.

Guidelines for assessment:

- Internal guide will evaluate students on understanding of topic, punctuality and Timely Completion of Report, Paper presentation/Publication and Attendance.
- An external examiner(s) panel will be assessing the seminar work based on these parameters - Understanding of Topic, flow of Contents, Presentation, report, Paper presentation/Publication, Question and Answers, Active Participation.

References:

1. Research papers from reputed journals/transactions- references necessary for the Project.
2. Reference books/Magazines for conceptual technical support.

CE 3205 Artificial Intelligence and Machine Learning Laboratory

Teaching Scheme	Examination Scheme
Practical: 4 Hr/Week	Practical: 50 Marks
	Credits : 2

Course Objectives:

To facilitate the learners to-

1. Experiment Artificial Intelligence and machine learning concepts from syllabus.
2. Experiment AI searches like A*, Min-max algorithm.
3. Understand monotonic and non-monotonic knowledge representation.
4. Experiment classification and clustering algorithms.

Course Outcomes:

By taking this course, the learner will be able to-

1. Implement various intelligent searching techniques.
2. Apply Knowledge Management techniques to implement truth maintenance system / Expert system.
3. Choose the appropriate supervised Machine Learning (ML) method and solve the given problem.
4. Choose the appropriate Unsupervised ML method and solve the given problem.

Example list of Assignments:

Assignments Group A (Mandatory)

1. Study: Learning simple statements in Prolog
2. Implement DFS/BFS for simple water jug problem
3. Implement A* algorithm for 8 puzzle problem
4. Implement Unification algorithm
5. Represent knowledge using Prolog by implementing small expert system
6. Implement Best first search algorithm

Assignments Group B (Any 3)

1. Write a program to implement Min-max algorithm for game playing
2. Write a program to implement Perceptron in artificial neural network
3. Write a program to implement SOM
4. Write a program to implement SVM/backpropagation learning algorithm

Assignment Group C

Develop any one machine learning tool for application: character/sign classification

PECE 3201 WIRELESS AND MOBILE COMMUNICATION

Teaching Scheme	**Examination Scheme**
Lecture: 3 Hrs. /week	In semester: 25 Marks
	End semester: 50 Marks
	Credits: 3

Prerequisite(s): Computer Networks (CE 3101)

Forward Course Linkage(s): -

Course Objectives:

To facilitate the learners-

1. To understand and remember fundamental concepts of Wireless Communication.
2. To compare different Wireless Network Standards.
3. To understand and apply Cellular system design fundamentals.
4. To understand modern mobile network architectures from design and performance perspective.

Course Outcomes:

By taking this course, the learner will be able to–

1. Understand basics of wireless communication and wireless standards.
2. Understand mobility management.
3. Recognize the important issues and concerns of Cellular system design.
4. Analyze evolution of mobile communication with recent trends and emerging technologies.

Unit 1: Introduction to Wireless Communication **(07)**

Introduction to wireless communication: Evolution, Types of wireless communication, Signals, antennas, signal propagation, mobile radio systems -examples, trends in cellular radio and personal communications, multiple access technologies Time Division Multiple Access (TDMA), Frequency Division Multiple Access (FDMA), Code Division Multiple Access (CDMA).

Unit 2: Wireless LAN Standards **(07)**

Overview of 802.11 a, b, g, n standards, Concept of Spread Spectrum- Frequency Hopping Spread Spectrum (FHSS), Direct Sequence Spread Spectrum (DSSS), Comparison amongst 802.11 standards, Introduction and overview of MAC for 802.11 networks Carrier sense multiple access (CSMA/CA), Overview of IEEE 802.16 WiMax.

Unit 3: Global System for Mobile Communication (GSM) System **(07)**

Introduction, GSM background GSM operational and technical requirements. Cell layout, GSM system architecture, elements of GSM architecture, Signal processing in GSM, Mobility management-Signaling protocols, Basic steps in the formation of a call, Handoff management.

Unit 4: General Packet Radio Service (GPRS) System **(07)**

Introduction and Need, GPRS system architecture, GPRS interfaces, GPRS transmission plane, GPRS Mobility Management, MS State Transition, GPRS, GPRS routing, and application.

Unit 5: Long Term Evolution Technologies (07)

Long Term Evolution(LTE) Technologies-Evolution to 4G, Orthogonal Frequency Division Multiplexing (OFDM), Downlink capacity comparison, Multiple Input Multiple Output (MIMO) spatial multiplexing, code words and layer mapping, Channel Coding schemes in LTE, Frequency Division Duplex (FDD) and Time Division Duplex (TDD).

Unit 6: Cellular System Design Fundamentals (07)

Introduction to Cellular system design concept, Importance of Frequency Reuse, Concept of Channel assignment and Handoff strategies, Interference and System capacity-Co-channel and Interference and System capacity, Channel planning for Wireless Systems Introduction to Trunking and Grade of service, Importance of Erlang B and C formula and Problem solving**.**

Text Books:

1. Mischa Schwart, '**Mobile Wireless communications'**, *Cambridge university Press*, ISBN 9781107412712 paperback (2013).
2. T.S. Rappaport, **"Wireless Communications: Principles and Practice'**, *Pearson Education / Prentice Hall of India*,(2nd edition), Third Indian Reprint (2003).
3 G. K. Behera Lopmudra Das, '**Mobile Communication'**, *Scitech publications (INDIA) PVT LTD*, (Revised edition).

Reference Books:

1. Asha Mehrotra, '**GSM System Engineering'**, *Artech House*, (2nd edition), (1997).
2. Jerry D. Gibson, **'The Mobile Communication'** Handbook, *IEEE Press.*
3. Jochen Schiller, '**Mobile Communication'**, *Pearson Education Asia*, (2nd edition).
4.Farooq Khan, **'LTE for 4G Mobile Broadband'**, *Air interfaces Technologies and Performance, Cambridge University Press.*
5. Krzysztof Wesolowski, '**Mobile Communication Systems'**, (Student edition), *Wiley publications*.

Web References:

1. LTE Advanced FDD/TDD – http://www.radio-electronics.com/info/cellulartelecomms/lte-long-term-evolution
2. NPTEL: Introduction to Wireless and Cellular Communications-onlinecourses.nptel.ac.in/noc17_cs37/preview

PECE 3201 Software Testing And Quality Assurance

Teaching Scheme
Lectures: 3 Hrs/Week

Examination Scheme
In Semester: 50 marks
End Semester: 50 marks
Credits: 3

Prerequisites: -

Course Objectives:
To facilitate the learner to -

1. Develop familiarity with the fundamental concepts and the process of software testing.
2. Understand need and concept of black box testing and White Box Testing
3. Understand the testing strategies and system testing
4. Understand Testing Metrics and Quality Assurance measures
5. Understand Recent Trends and Automated Testing

Course Outcomes:
By taking this course, the learner will be able to -

1. Apply the fundamental concepts and the process of software testing.
2. Make use of the concepts of black box testing and White Box Testing methods
3. Make use of the testing strategies and system testing
4. Make use of Testing Metrics and Quality Assurance measures and compare techniques of automated testing and modern testing tools for testing various types of applications.

Unit 1: Introduction (06)
Need of testing, Basics of Software Testing, Testing Principles, Goals, Software Testing Life Cycle, Defects, Defect management, Verification and validation, Test Plan.

Unit 2: Black Box Testing (08)
Introduction, Need of black box testing, Testing Methods - Requirements based testing, Positive and negative testing, Equivalence Class Partitioning, Boundary value analysis, Decision table / Cause effect graphing, State based testing, Domain testing, Examples of Black-Box testing.

Unit 3: Testing Strategies and System Testing (07)

Unit, Integration, System, Acceptance testing, Usability testing, Regression testing, Scenario testing, Adhoc testing, Functional, Performance testing, Stress testing, Security testing, Alpha-Beta testing.

Unit 4: Testing Metrics and Quality Assurance (07)
Testing Metrics and measurements, Types of metrics – Project, Progress, Productivity, Software quality, Quality control and assurance, Quality factors, Software Quality Assurance (SQA) Model - Six Sigma, Ishikawa's Seven Basic Tools.

Unit 5: White Box Testing (07)
Introduction, Need of white box testing, Testing types, Static testing, Structural Testing – Unit / Code functional testing, Code coverage testing, Code complexity testing, Challenges in White box testing, Examples of White-Box testing.

Unit 6: Recent Trends and Automated Testing (07)
Agile Testing, Model based testing, Need for Automation, Keyword driven automation, Data driven automation, Manual testing versus Automated testing, Automated Testing Tools, Selection of tool, Study of Testing tools and frameworks (such as Selenium, JUnit, Bugzilla).

Text books:

1. Iien Burnstein, '**Practical Software Testing',** *Springer (India) private limited* (2005).
2. Srinivasan Desikan,Gopalaswamy Ramesh, **Software Testing Principle and Practices'**, *Pearson Education*, ISBN 81-7758-121-X (2013).
3. Nageshwar Rao Pusuluri, '**Software Testing Concepts and Tools',** *Dreamtech press*, ISBN 81-7722-712-2 (2008).

Reference books:

1. Ron Patton, **'Software Testing',** *Pearson Education,* ISBN-13: 978-0-672-32798-8 (Second Edition) (2013).
2. Stephen H Kan, '**Metric and Model in Software Quality Engineering'**, *Pearson Education* ISBN 81-297-0175-8 (Second Edition) (2006).
3. William Perry, **'Effective Methods for Software Testing'**, *Wiley Publication*, ISBN 81-265-0893-0 (Third Edition) (2006).
4. Dr. K.V.K.K. Prasad, '**Software Testing Tools'**, *Dreamtech Press* ISBN: 10:81-7722-532-4 (2008).
5. Naresh Chauhan, '**Software Testing Principles and Practices'**, Oxford *University Press*, ISBN 0-19-806184-6 (2011).

Web References

1. http://www.seleniumeasy.com/selenium-tutorials
2. https://www.tutorialspoint.com/junit

3. https://www.bugzilla.org

PECE 3201 Human Computer Interaction

Teaching Scheme	**Examination Scheme**
Lectures: 3 Hrs /week	In Semester: 50 marks
	End Semester: 50 marks
	Credits: 3

Course Objectives:

To facilitate the learner to-

1. Identify the main modes of human computer interaction.
2. Identify the common pitfalls in data analysis, interpretation and presentation.
3. Understanding the use of prototyping and evaluation in design.
4. Understand the advanced techniques of Human Computer Interaction.

Course Outcomes:

By taking this course, the learner will be able to:

1. Apply the concepts of HCI to enhance the user experience.
2. Select the appropriate data gathering techniques and establish the requirements for the good design.
3. Apply the fundamental aspects of designing and evaluating the interfaces.
4. Compare the advanced techniques of Human Computer Interaction.

Unit 1: Introcuction to Interactive Design (08)

What is HCI – design, models, evaluation, Need to understand people, computers and methods.
Humans – Memory, Attention Span, Visual Perception, psychology, ergonomics.
Computers – speed, interfaces, widgets, and effects on interaction.
Understanding Users, Universal Design, User-centered design.

Unit 2: Design Process and Interaction Styles (08)

HCI in the Software Process, HCI design principles and rules, Shneiderman’s golden rules, Normans seven principles, Nielsens ten heuristics with example of its use.
Interaction Styles, Direct Manipulation - Menu selection, Form Fill-in and Dialog Boxes

Unit 3: Establishing Requirements (07)

Understanding importance of identifying the requirements, Different kinds of requirements, Data gathering for requirements, Data analysis, Data interpretation and presentation,
Task description and analysis.

Unit 4: Design, Prototyping, and Construction (06)

Prototyping and construction, Conceptual design, Physical design, User Persona, Using scenarios in design, Using prototypes in design and support for design, Handling errors and designing help.

Unit 5: Evaluation Approaches (06)

Importance of evaluation, Evaluation approaches and methods, Evaluation case studies, Determine, Explore, Choose, Identify, Decide, Evaluate (DECIDE): A Framework to guide evaluation.

Unit 6: New Interaction Technologies (07)

Explicit and Implicit Human Computer Interaction, User Interfaces and Interaction for Four Widely Used Devices, Hidden User Interface via Basic smart Devices, Hidden User Interface via Wearable and Implanted Devices.

Text books:

1. Rogers, Sharp, Preece, 'Interaction Design', Wiley Publications (India), (Third edition), (2014).
2. Ben Shneiderman, Catherine Plaisant, Maxine Cohen, Steven Jacobs, 'Designing the User Interface: Strategies for Effective Human-Computer Interaction', Pearson Education Limited (India),(2010).
3. Stefan Poslad, 'Ubiquitous Computing', Wiley Publications (India), (2014).

Reference Books:

1.Alan Dix, 'Human Computer Interaction', Pearson Education Limited (Third edition), (2004).
2.Wilbert O. Galitz, 'The Essential Guide to User Interface Design', Wiley Publications (Second edition), (2003).
3.John M. Carroll, 'Human-Computer Interaction', Pearson Education Limited, (2002).
4.Don Norman, 'The Design of Everyday Things', Basic Books, A member of the Perseus Books Group, (2013).

PECE 3201 – Multimedia Systems

Teaching Scheme:	**Examination Scheme:**
Lectures: 3Hrs/Week	In-Semester: **50** Marks
	End-Semester: **50** Marks
	Credits: 3

Course Objectives:

To facilitate the learners to -

- Understand basics of Multimedia Systems.
- Understand various file formats.
- Learn Multimedia editing tools.
- Analyze various compression techniques.
- Learn advances in multimedia.

Course Outcomes:

By taking this course, the learner will be able to

- Build the knowledge of multimedia systems and its characteristics.
- Utilize text and audio file formats and compression techniques in multimedia applications.
- Apply digital image and video processing techniques useful in multimedia applications.
- Build the knowledge of animation and Virtual reality concepts.
- List and analyse advances in multimedia.

Unit – I: Introduction to Multimedia **(06)**

What is Multimedia? (Text, Graphics, Audio, Video, Animation), Multimedia presentation and production, Multimedia Authoring Tools (Various tools for creation and editing of Multimedia Projects), Hardware and Software requirement for Multimedia, Multimedia Applications

Unit – II: Text and Audio **(08)**

Text - Introduction, About Fonts and Faces, Using Text in Multimedia, Font Editing and Design Tools, Text Compression (HUFFMAN, LZ, LZW), File Formats (TXT, DOC, RTF, PDF, PS), Hypertext and Hypermedia.

Audio – Introduction, Characteristics of Sound, Elements of Sound System, Digital Audio, Synthesizer, MIDI, Audio File Formats (WAV, VOC, MP3) , Audio Processing Softwares.

Unit – III: Images **(07)**

Digital Image, Basic steps for image processing, Image file formats (BMP, TIFF), Image Compression (RLE, JPEG), Image Manipulation, Image processing softwares.

Unit – IV: Video **(07)**

Types of Video Signals, Analog Video, Digital Video, Video File Formats and CODEC (AVI, MPEG), Video Editing Softwares.

Unit – V: Animation and Virtual Reality (07)

Animation- Introduction, Uses, Types, Principles, Animation on Web, 3D animation, Rendering, Animation Softwares
Virtual reality - Introduction, Forms, Applications, Software Requirements, Devices, VRML

Unit VI: Introduction to Advances in Multimedia (07)

Introduction, Challenges of Multimedia Information processing, Watermarking, Organization, Storage and retrieval Issues, Neural Networks for multimedia processing, Multimedia Processors

Text Books:

1. Ranjan Parekh, **‘Principles of Multimedia’**, *McGraw Hills education*, (2nd edition), (2013)
2. Ralf Steinmetz, Klara Nahrstedt, **‘Multimedia: Computing, Communications and Applications’**, *Pearson*, (8th Impression 2011)
3. Nigel Chapman & Jenny Chapman, **‘Digital Multimedia’,** *Wiley Publications*, (2nd edition) (2004)

Reference Books:

1. Ze-Nian Li, Marks S. Drew, **‘Fundamentals of Multimedia’**, *Pearson Education*, (2005)
2. Tay Vaughan , **‘Multimedia: Making it work’**, *Tata McGraw-Hill, (*8th edition), (2011)
3. Judith Jeffcoate, **‘Multimedia in Practice’**, *Prentice Hall of India*, (2003)

PECE 3202 Data Mining and Data Warehousing (Elective-IV)

Teaching Scheme	**Examination Scheme**
Practical : 3 Hrs/week	In Semester : 25 Marks
	End semester : 50 marks
	Credits : 3

Prerequisite : Database Management Systems (CE 3102)

Course Objectives

To facilitate the learners to -

1. Understand the concepts and techniques of data mining and data warehousing
2. Apply various data pre-processing and visualisation techniques
3. Design and model a data warehouse and its components
4. Compare and analyse various Data Mining algorithms based on performance parameters
5. Understand advances in the field of Data Mining

Course Outcomes

By taking this course, students will be able to –

1. Explore the concepts of data warehousing and data mining for modern day BI
2. Apply appropriate pre-processing techniques to make data ready to be used for various data mining algorithms
3. Design a Data warehouse model by using appropriate data modelling schema
4. Evaluate various data mining algorithms based on their outcomes for the given dataset
5. Understand the advances in the field of Data Mining

Unit 1	**Introduction to Data Mining and Data Warehousing** Introduction to data warehousing and data mining, Evolution of decision support systems, operational data Vs. historical data (data warehouse data) Importance of data preparation for data mining, types of data mining techniques, various data mining functionalities Data mining task primitives, Integration of operational systems and data warehousing system	5
Unit 2	**Data Pre-processing** Introduction / overview of data pre-processing, Descriptive data summarization – Measuring central tendency, dispersion, range, quartiles, variance and standard deviation of data, Graphical displays of descriptive data summaries, Data cleaning, Data Integration, Data Transformation, Data Reduction	7

Unit 3	**Data Warehouse and OLAP Technology** 3-tier Data Warehouse architecture, data warehouse design process, Modelling subject(s), dimensions and measures, Multidimensional data modelling using star schema, snowflake schema and fact constellation schema Introduction to OLAP, OLAP operations, Data cube generation, Concept hierarchy generation, Case study on designing a Data warehouse for a given application	6
Unit 4	**Unsupervised Learning** Data mining process, Types of Data Mining Systems, Cluster Analysis - Types of Data in Cluster Analysis, Categorization of Major Clustering Methods, K-means clustering, Density based Clustering	6
Unit 5	**Supervised Learning** Classification and Regression, Decision Tree Induction, Bayesian Classification Nearest neighbour approach, Mining frequent patterns and Association Rules – Apriori Algorithm	7
Unit 6	**Advances in Data Mining** Information Retrieval, Text mining, multimedia data mining, Graph mining, Mining World Wide Web, stream, time series and sequence data mining	5

References

Text Books

1. Han, J., and Kamber, M., “Data Mining: Concepts and Techniques”, 3rd Ed., Morgan Kaufmann, 2006

2. Tan P.N., Steinbach M., Kumar V., “Introduction to Data Mining”, Addison Wesley, 2006

Reference Books

1. W. H. Inmon, "Building the Data Warehouse", 4th edition, Wiley

2. Alex Berson, Stephen J, "Data Warehousing, Data Mining, & OLAP", Tata McGraw- Hill, 2004

3. Dunham M.H., “Data Mining: Introductory and Advanced Topics”, Prentice Hall, 3

4. Miller T. W., “Data and Text Mining - A Business Applications Approach”, Pearson education 2008

5. Maimon O., Rokach L., “Data Mining And Knowledge Discovery Handbook”, Springer 2009

6. Pujari A K, “Data Mining Techniques”, Universities Press, 2010

Web Resources :

1. www.autonlab.org/tutorials : Statistical Data mining Tutorials

2. www-db.standford.edu/ullman/mining/mining.html : Data mining lecture notes

3. ocw.mit.edu/ocwweb/slon-School-of-management/15-062Data-MiningSpring2003/course home/index.htm : MIT Data mining open course ware

4. www.kdnuggets.com : Data mining resources

Web links of similar courses offered at other universities

1. Purdue University : Introduction to Data mining : www.cs.purdue.edu/homes/clifton/cs490d/

2. University of New South Wales : Data warehousing and Data mining www.cse.unsw.edu.au/~cs9318/

3. York University: Data mining www.cs.yorku.ca/course-archieve/2005-06/w/4412/

4. IIT- Madras : Data Mining www.iitm.ernet.in/~cs672/

5. New York University: Data warehousing/mining www.cs.nyu.edu/courses/spring03/G22.3033-015

6. NPTEL Data Warehousing Data Mining Web course - http://nptel.ac.in/syllabus/syllabus_pdf/106106105.pdf

Journals

IEEE Transactions on Knowledge and Data Engineering

PECE 3202 Elective–IV EMBEDDED AND REAL TIME SYSTEMS

Teaching Scheme	**Examination Scheme**
Lecture : 3 Hrs/week	In semester : 25 marks
	End semester : 50 marks
	Credits : 3

Prerequisite:

- Microprocessor Architecture (CE 2204)

Forward Linkages :

- Internet of Things (CE 4201)

Course Objectives:

To facilitate the learners :-

1. To understand processors, its components use for embedded product.
2. To implement use of system hardware in various embedded designs.
3. To differentiate between use of embedded communications protocols and its interfacing to memory and processor.
4. To execute smaller codes written for embedded system programming using different languages.
5. To Understanding real time operating systems and compare different scheduling algorithms.

Course Outcome:

By taking this course, the learner will be able to :–

1. Summarize embedded systems with different components and design process.
2. Design an embedded system for a given application using system hardware components.
3. Analyze processor, memory, input/output and communication protocols requirement for a given embedded system.
4. Develop skills for embedded system programming.
5. Summarize the RTOS and exemplary operating system used for various embedded applications.

Unit 1: Introduction to Embedded Systems (06)

Components of Embedded System & its Classification, Characteristic of embedded system. Structural Units of Processor, Comparision of Microprocessors & Microcontrollers(8051 block diagram).

Introduction to embedded processor, Digital Signal Processor, Application Specific System Processor, Multiprocessor systems using General Purpose Processor. Complex Instruction Set Computer (CISC) and Reduced Instruction Set Computer(RISC) Processor architectures.

Design Process in Embedded System, Design metrics, Steps in design process. Challenges in Embedded System design, Embedded System Examples.

Unit 2: System Hardware (08)

Advanced RISC Machines (ARM7) Processor - Architecture, Register set, Modes of operation, Interrupt Structure and ARM family and their applications**.** Comparison with ARM9. Details of Components of Embedded Systems-Management of Power Supply, Clocking Unit, Real Time Clock and Timers, Reset Circuitry and Watchdog Timer.

Memory Map Of Embedded System, Interfacing Processors with design examples.

Unit 3: Memory and I/O interfacing and Communication Buses (07)

Processor and Memory Selection, I/O devices, sensors - temperature, IR, ADC / DAC, Optical Devices such as LED / LCD Display devices, Opto-Isolator, Relay & stepper motor, Timers/Counters.

Parallel v/s serial communication. Parallel ports their uses in device interfacing.

Different serial communication Protocols- RS232C, RS 485, CAN, & USB – Protocol Architecture, topology, different Packets, Communication Cycle, Arbitration, few Applications.

Unit 4 : Programming concepts, Embedded System Programming (07)

Programming in Assembly labuage using ARM processor, Use of High level Language – C and Python for Embedded System Applications, Selection of data strcutures, Micro, function, statement, loops etc, Embedded system programming using Developent boards, Development tools – Simulator / emulator / debugger.

Unit 5: Real time Operating System (07)

Operating Systems Concepts, Real-Time Systems, Real-Time Tasks, Types of Real-Time Tasks, Real-Time Operating Systems, Scheduling Algorithms – Pre-emptive, non preemptive, Real time

Unit 6: Exemplary Operating Systems and Representative Embedded System (07)

Examples of Real Time OS, embedded System OS and Handheld OS. Representative Embedded Systems – Digital Thermometer, smart card Design Examples and case study of - Automatic Vending machine / Automatic Cruise control System their Block diagram, class diagrams.

Text Books:

1. Rajkamal, **'Embedded System Architecture Programming Design'** *Tata Graw Hill Publication (Second Edition)*, (2008).
2. Dr. K. V. K. K. Prasad '**Embedded / real time System : Concepts, Design, & Programming – Black Book'** *Dreamtech Press Publication, (2003).*
3. Lyla B. Das, '**Embedded Systems: An Integrated Approach**', *Pearson Education*, (2012).

References:

1. Dr. K. V. K. K. Prasad, Gupta Dass, Verma, **'Programming for Embedded system'** *Wiley – Dreamtech India Pvt. Ltd.*
2. ARM 7 Manual.
3. CAN Specification Version 2.0 Protocol Standard.
4. USB Specification Version 2.0 Protocol Standard.
5. I2C Specification Protocol Standard.

PECE 3202 LINUX INTERNALS

Teaching Scheme
Lectures: 3 Hrs/week

Examination Scheme
In Semester: 25 marks
End Semester: 50 marks
Credits: 3

Prerequisites: Operating Systems (CE 2203)

Course Objectives:
To facilitate learners -

1. To understand basic concepts of Unix Operating System
2. To understand Linux kernel and environment.
3. To understand process and memory management in Linux
4. To learn basics of Inter process communication w.r.t. Unix/Linux.

Course Outcomes:
The learner will be able to -

1. Recall basic knowledge about Unix operating system.
2. Understand Unix and Linux environment.
3. Understand basics in process, thread management.
4. Explain concepts inter-process communication.

Unit I: Foundation of Unix operating system (07)

Introduction, Kernel architecture, types of kernel,Operating system: Booting process, Grub I, Grub II,Representation of files, systems call File system,Concept of Buffer management in Unix/Linux.

Unit II: Process and threads in Linux (08)

Process states and transitions, layout of system memory,Context of a process, saving the context of a process ,Concept of threads, Linux processes and thread management, introduction to threads (advantages and implementation),Process management and Linux scheduler.

UNIT III: Swapping and Demand paging (07)

Swapping, Demand Paging, A hybrid system with swapping and demand paging, Linux memory management.

UNIT IV: Inter-process Communication in Linux (07)

Process tracing, system V IPC, Network communication, sockets, Multiprocessor systems : problem with multiprocessor systems, solution with master slave processes, Linux Inter process communication: User level IPC mechanism, Kernel synchronization, socket programming

UNIT V: MAKE and AWK (07)

Search and Sort tools: grep, egrep, fgrep, MAKE tool: When to use MAKE, Macros, abstractions and shortcuts, make, nmake, cmake. Awk tool: AWK syntax, AWK grammar, awk scripting

Unit VI: Variants in Linux (06)

Hand-held systems: requirements, Linux as hand-held operating system, Linux for distributed systems, technology overview, Case study: Google Android

Text books:

1. Maurice J. Bach , **'The Design of the Unix Operating System'** , Third Edition,2013, Pearson , ISBN 978-81-203-0516-8.
2. Pramod Chandra P. Bhatt, **'An introduction to Operating Systems: Concepts and Practice(GNU/Linux)'** , PHI, (Fourth edition), (2014), ISBN-978-81-203-4836-3.

Reference books:

1. Evi Nemeth, Garth Snyder, Tren Hein, Ben Whaley, **'Unix and Linux System Administration Handbook'** , Pearson , (Fourth Edition), (2014), ISBN: 978-81-317-6177-2011.
2. William Stallings, **'Operating System-Internals and Design Principles' ,** Prentice Hall India, ISBN-81-297-0 1 094-3.
3. David Rusling, **'The Linux Kernel'** , Addison Wesley, (Second edition), ISBN 978-0201770605.
4. Sumitabha Das, **'UNIX Concepts and Applications'**, ISBN 0-07-053475-6.

PECE 3202 Elective III Image Processing

Teaching Scheme
Lecture : 3 Hrs/week

Examination Scheme
In semester : 50 marks
End semester : 50 marks
Credits : 3

Prerequisite:
“-”

Forward course linkages:
Pattern Recognition And Machine Learning (PECE 4101)
Bio medical Image Processing (OE 4101)

Course Objectives:

To facilitate the learner to-

1. Understand basic concepts of digital image processing.
2. Learn and apply image enhancement and Image Segmentation techniques.
3. Understand object Recognition, Image Restoration and reconstructions.
4. Learn and apply image compression techniques and Understand image processing applications.

Course Outcome:

By taking this course, the learner will be able to -

1. Apply basic steps of digital image processing on given images

2. Select the image enhancement techniques

3. Make use of Image Restoration, reconstructions techniques. Choose Image Segmentation techniques for given images.

4. Identify the image compression techniques.

Unit 1: Introduction to Image Processing **(07)**

Introduction to digital image processing: Origin, usage and application of image processing, Fundamental steps and component of image processing system,representation of digital images. Elements of matrix theory,Arithmetic Operations,introduction to Human Visual System,Image sensing and acquisition,Basic concepts in sampling and quantization

Unit 2: Image Enhancement Techniques **(08)**

Basic image preprocessing (contrast enhancement, simple noise reduction, color balancing), some basic gray level transformations,Histogram Processing,Spatial filtering, Smoothing and Sharpening Spatial filters

Unit 3: Image Compression **(07)**

Introduction to Image Compression and its need, Coding Redundancy,Classification of Compression Techniques (Lossy and Losless - JPEG,RLE, Huffman, Shannon fano), Scalar & Vector Quantization.

Unit 4: Image Restoration & Reconstruction. (06)

Model of Image degradation, Noise Models,Classification of image restoration techniques,Inverse filtering, Wiener filtering,Blind-deconvolution techniques

Unit 5:

Image Segmentation, Analysis and Object Recognition. (08)

Introduction to feature extraction: Edges, Lines & corners detection,Texture & shape measures.

Segmentation & thresholding, region extraction, edge (Canny) and region based approach, use of motion in segmentation.

Introduction to Object Recognition, Object Representation(Signatures, Boundary Skeleton), Simple Boundary Descriptors, Regional descriptors (Texture).

Unit 6: Advances in Image processing Applications (06)

Medical Image Processing, Face detection, Iris Recognition, Remote Sensing, Synthetic-aperture radar (SAR) Image Processing

Text Books:

1. R.C. Gonzalez, R.R. Woods, '**Digital Image Processing'**, ISBN 978-81-317-2695-2,*Person (*Third Edition) ,(2011)(62 copies)
2. Sridhar S. '**Digital Image Processing',** *Oxford University Press, (Second Edition),(2016)*
3. S.Jayaraman, S. Esakkirajan,T. Veerakumar , **'Digital Image processing',**ISBN 978-0-07-014479-8, *Mcgraw Hills Publication (Tenth reprint),(2013)*

References:

1. Sonka, Hlavac, Boyle, '**Digital Image Processing and Computer Vision',** ISBN 978-81-315-0555-7,*Cenage Learning* (Sixth Indian Reprint) ,(2011)
2. B. Chanda, D.Datta Mujumdar '**Digital Image Processing And Analysis',** *PHI*, ISBN 978- 81-203- 4325-2, (Second Edition),(2013)
3. Anil Jain, '**Fundamentals of Digital Image Processing'**, *PHI*, ISBN-81-203-0929-4 (Indian Reprint) ,(1995)
4. Basudeb Bhatta **' Remote Sensing and GIS'** *Oxford University Press*, ISBN 978-0-19-807239-3 (Second Edition)(2014)

Web Reference

1 https://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=6504845

PECE 3203 Data Mining and Data Warehousing Laboratory

Teaching Scheme	**Examination Scheme**
Practical: 2 Hrs / week	**Oral: 25 marks**
	Credit: 1

Course Objectives:
To facilitate the learners to -

1. Model and build a data mart / data warehouse.
2. Study and analyze various open source data sets to pre-process them using open source data mining tools.
3. Implement data mining algorithms to discover interesting patterns.
4. Analyze results of data mining algorithms

Course Outcome:
By taking this course, the learner will be able to –

1. Model a data warehouse, using appropriate schema for the given application
2. Apply various pre-processing techniques on the given dataset
3. Analyze various data mining algorithms on real time data
4. Practice advanced Data Mining functionalities such as Text Mining and Mining unstructured data.

Example List of Assignments

Assignments Group A (Mandatory)

1. Explore WEKA Data Mining / Machine Learning Toolkit and perform the following operations : Understand the features of WEKA toolkit, Study the arff file format, explore the available data sets in WEKA.
2. Load any one dataset in Weka and observe the following : List the attribute names and their types, Number of records in each dataset, class attribute (if any), Plot Histogram, Determine the number of records for each class, Visualize the data in various dimensions; Apply various pre-processing tasks; Apply classification OR clustering algorithms on the chosen dataset and observe the results
3. Implement K-means clustering algorithm using a programming language that you are familiar with such as Java / Python. Compare the performance of your algorithm on the dataset, used in Weka, on different parameters such as accuracy, scalability, efficiency etc. by changing input parameter value such as K.

Assignments Group B (Any 2)

1. Implement DBSCAN clustering algorithm. Compare the performance of your algorithm on the dataset, used in Weka, on different parameters such as accuracy, scalability, efficiency etc.
2. Implement a decision tree classification algorithm. Compare the performance of your algorithm on the dataset, used in Weka, on different parameters such as accuracy, scalability, efficiency etc.
3. Implement Apriori, a Frequent Pattern Analysis algorithm. Assume suitable data. Compare the performance of your algorithm on the dataset, used in Weka, ondifferent parameters such as accuracy, scalability, efficiency etc.
4. Implement Information Retrieval using TF / IDF algorithm. Assume suitable data.

Assignments Group C (Any 1)

1. Build a Data Warehouse / Data Mart (using open source tools like Pentaho or other data warehouse tools like Microsoft - SSIS etc.) Identify source tables and populate sample data Analyze which multidimensional model (Star, snowflake and Fact constellation) will be best suited for the given application and design the schema (Example Applications can be Banking, Insurance, Finance, Health care, Manufacturing, Automobile, etc.)
2. Study any of the existing data warehouse / data repository / ... and prepare your report based on data / model / tools and techniques / software used etc.
3. Download, install and study the features of any open source data mining compare its features with Weka.

PECE 3203 Embedded Systems and Real time Operating Systems Laboratory

Practical : 02 Hours/Week

Examination Scheme:
Oral : 25 Marks
Credit : 1

Course Objectives:

By taking this course the student will learn to-

1. Understand various embedded development boards.
2. Implement different components of embedded systems on development boards.
3. Implement using assembly level language or high level language.
4. Develop mini applications based on embedded systems knowledge with proper design process.

Course Outcomes:

On completion of the course, student will be able to–

1. To apply the knowledge of embedded system to real time applications.
2. To apply the knowledge of various components to interface with embedded develoment boards.
3. To apply the knowledge of embedded programming for solving the given problem.
4. To apply the knowledge of design process to implement smaller applications.

List of Laboratory Assignments

SrNo	Assignment
1	Study of Operating System based Evaluation/development Board (16 or 32 bit Microcontroller based) – Hardware & IDE Software.
2	Write a Program to read input from the switches and display on LED using Microcontroller development board.
3	Write a Program in C language to read key press from keypad and display the key ID on LED or LCD.
4	Write a program in C to control the relay operation as per switch position and to indicate its status on LEDs.
5	Write program in C language for Data Acquisition System to Acquire data from ADC Channel , Convert it into Digital Format & transmit to PC.
6	Write a Program in C language to perform serial communication, Which Generates Packets of 32 Bits, where First bit of packet indicates whether the packet is control packet or data packet.
7	Write a Program in C language to communicate with PC serially.
8	Implement process control application/s using the peripherals such as LED/LCD, Keyboard, ADC, Relays, Switches etc.
9	Write a Shell Script that display the no. of readable, writable & executable files in specified Directory.
10	Write a C Program that takes string input from keyboard & Displays the Length of string - use Multi Threading for message Que or Shared Memory.
11	Write a program that demonstrates the communication between two Processes.
12	1. Study of ***Compiling the Embedded Linux kernel*** 2. selecting the kernel source 3. configuring the kernel 4. compiling or building the kernel modules 5. installing the kernel modules 6.

	7. ***Building the File System*** 8. basic structure of the root file system 9. kernel modules 10. kernel images 11. device files 12. BusyBox 13. Selecting a file system 14. RAMdisk 15. 16. ***Building the Toolchain*** 17. binutils 18. gcc glibc

PECE 3203 Linux Internal Laboratory

Teaching Scheme	Examination Scheme
Practical: 2Hrs/week	Oral – 25 Mark
	Credits: 1

Course Objectives:

To facilitate learners -

1. To understand basic commands of Unix Operating System
2. To understand and write shell script for a given problem statement.
3. To apply socket programming concepts
4. To learn basics of awk programming.
5. To apply Inter process communication concepts for solving a problem

Course Outcomes:

The learner will be able to -

1. recall basic knowledge about Unix operating system.
2. understand and write shell script for a given problem statement.
3. understand and apply socket programming concepts .
4. apply awk scripting basics to write programs.

Group A (Mandatory)

1. Write a shell script that displays a list of all the files in the current directory to which the user has read, write and execute permissions.
2. Write a shell script to find factorial of a given integer.
3. Implement in Java (modular programming) the following UNIX commands using System calls

   A. cat
   B.ls
   C.mv

4.Write an IPC program using pipe. Process A accepts a character string and Process B inverses the string. Pipe is used to establish communication between A and B processes using Python or Java
5. grep,Make, nmake commands

Group B (Any 4)

1.Write an awk script to count the number of lines in a file that do not contain vowels.

2.Write client and server programs (using Java) for interaction between
server and client processes using Unix Domain sockets.
3.Write a python program for creating virtual file system on Linux environment.
4. Write a program in Java/Python to create a RAMDRIVE and associate an acyclic directory structure to it.
5.Write a Java program to create a Zombie process.
6.Write a Java/Python program that illustrates two processes communicating using shared memory

Group C (Any one)

1. Make tool (dependency file structure)

Image Processing Laboratory (PECE 3203)

Teaching Scheme
Practical: 2Hrs/week

Examination Scheme
Oral – 25 Marks
Credits: 1

Prerequisite:
Digital Signal Processing And Applications (PECE 3201)

Course Objectives:_
To facilitate the learners to
1. Learn Basics Image Processing operations like image Read, Write,add,subtract
2. Understand and apply algorithms used for image enhancement, edge detection
3.Able to develop Image Processing application using various techniques.
4.Learn and use different Image Processing Tools

Course Outcome:
By taking this course, the learner will be able to –
1. Apply basic operations on given image
2. Apply algorithms used for image enhancement, edge detection
3. Develop small image processing application using various techniques.
4. Use Image Processing Tools

List of assignments

Group A: (Mandatory)
1.Write a program to create a simple image file in .tiff format, and display it .
2.Write a program to perform Intensity Transformation technique on given image
3. Write a program for image enhancement techniques

Group B: (Any Three)
1)Write a program using derivative filtering technique for edge detection
2) Write a program to illustrate Morphological transformation using Dilation
3)Write a program to illustrate Morphological transformation using Erosion
4) Write a program to illustrate Image Restoration techniques

Group C: (Any One)
Implement any of the following small application/ or any Image processing application using MATLAB/ OpenCV

1. Medical Image Processing
2. Face detection
3. Iris Recognition
4. Finger Print detection